DB2 Universal Database for OS/390

Text Extender: Administration and Programming

Version 6

SC26-9651-00

Note

Before using this information and the product it supports, be sure to read the general information under "Notices" on page 257.

First Edition, June 1999

This edition applies to DB2 UDB for OS/390 Text Extender, a feature of Version 6 of DB2 Universal Database for OS/390, 5645-DB2, and to all subsequent releases and modifications until otherwise indicated in new editions.

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About this book

DB2 UDB for OS/390 Text Extender is a full-text retrieval program primarily for searching in text files stored in a DB2 Universal Database for OS/390 subsystem, but also for searching in text files stored elsewhere. It provides extensions to the Structured Query Language (SQL) that work with a powerful and intelligent search engine to let you search quickly and efficiently for information in unstructured text.

This book describes how to use Text Extender to prepare and maintain a DB2 UDB server for OS/390 for text data. It also describes how you can use user-defined functions (UDFs) and application programming interfaces (APIs) provided by Text Extender to access and manipulate this data. References in this book to ″DB2″ refer to DB2 UDB for OS/390 Version 6 or higher.

Who should use this book

This book is intended for DB2 database administrators who are familiar with DB2 administration concepts, tools, and techniques.

This book is also intended for DB2 application programmers who are familiar with SQL and with one or more programming languages that can be used for DB2 application programs.

This book is for people who will work with Text Extender. People who work with the DB2 Image, Audio, and Video Extenders should see *DB2 Image, Audio, and Video Extenders Administration and Programming.*

How this book is structured

This book contains the following chapters:

Part 1: Guide

Chapter 1. An overview of DB2 extenders
Introduces Text Extender and describes other products in the DB2 Extender family.

Chapter 2. Planning a text index
Helps you decide which type of text index suits your requirements.

Text Extender administrators need this information to help them set up the default index type in the text configuration information.

Text Extender users need this information when enabling a text table, or individual text columns for searching.

Chapter 3. Linguistic processing
How Text Extender analyses document terms when indexing, search terms when searching, and matched terms when highlighting in a found document.

Text Extender users need this information to help them build more effective search terms.

Chapter 4. Administration
Describes the Text Extender command line processor.

Text Extender administrators need this information when setting up a Text Extender server. users.

Text Extender users need this information to prepare tables and individual text columns for use by Text Extender.

Chapter 5. Searching with Text Extender UDFs
Describes the user-defined SQL functions (UDFs) provided by Text Extender.

Text Extender users need this information when including text search subqueries in SQL queries.

Chapter 6. Using the API functions for searching and browsing
Describes the application program interface (API) functions provided by Text Extender.

Text Extender users need this information when including text search subqueries in application programs.

Part 2: Reference

Chapter 7. Administration commands for the client
Syntax and description of the administration commands for the client in alphabetical order.

Chapter 8. Administration commands for the server
Syntax and description of the administration commands for the server in alphabetical order.

Chapter 9. UDTs and UDFs
Description of the UDTs provided by Text Extender, and the syntax and description of the Text Extender UDFs in alphabetical order.

Chapter 10. Syntax of search arguments
The syntax of search arguments used in SQL queries and in the API functions.

Chapter 11. API functions for searching and browsing
The syntax and description of the API functions in alphabetical order.

Chapter 12. Return codes
An explanation of the return codes from the API functions.

Chapter 13. Messages
An explanation of the messages from the UDFs, and from the administration command line processor.

Chapter 14. Configuration
A description of environment variables for Text Extender, and of the text configuration that contains default setup information.

Chapter 15. Sample API program
A sample C program that uses the API functions.

Chapter 16. Error event reason codes
A description of error-event reason codes that can occur during indexing.

How to read the syntax diagrams

Throughout this book, syntax is described using the structure defined as follows:

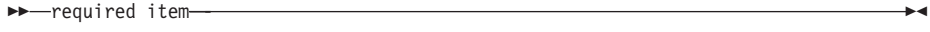
- Read the syntax diagrams from left to right and top to bottom, following the path of the line.

  The ►►— symbol indicates the beginning of a statement.

  The —► symbol indicates that the statement syntax is continued on the next line.

  The ►— symbol indicates that a statement is continued from the previous line.

  The —►◄ symbol indicates the end of a statement.
- Required items appear on the horizontal line (the main path).

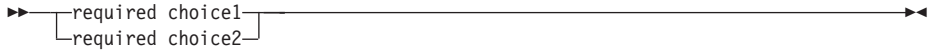


- Optional items appear below the main path.

- If you can choose from two or more items, they appear in a stack.

How to read the syntax diagrams

If you *must* choose one of the items, one item of the stack appears on the main path.



If choosing none of the items is an option, the entire stack appears below the main path.

A repeat arrow above a stack indicates that you can make more than one choice from the stacked items.

- Keywords appear in uppercase; they must be spelled exactly as shown. Variables appear in lowercase (for example, `srcpath`). They represent user-supplied names or values in the syntax.
- If punctuation marks, parentheses, arithmetic operators, or other such symbols are shown, you must enter them as part of the syntax.

Related information

DB2 for OS/390 Version 6

DB2 Universal Database for OS/390 Version 6 Application Programming and SQL Guide, SC26-9004. This book describes how to design and write application programs that access DB2 UDB for OS/390.

DB2 Universal Database for OS/390 Version 6 SQL Reference, SC26-9014. This book describes the Structured Query Language (SQL) for DB2 UDB for OS/390.

DB2 Universal Database for OS/390 Version 6 ODBC Guide and Reference , SC26-9005. This book describes how to use DB2 CLI in applications to access DB2 servers.

DB2 Universal Database for OS/390 Version 6 Messages and Codes ,GC26-9011. This book lists DB2 messages and codes, and specifies recovery actions.

DB2 Universal Database for OS/390 Version 6 Administration Guide , SC26-9003. This book describes how to administer DB2 for OS/390.

Program Directory for IBM Database 2 Universal Database Server for OS/390, Volume 1 of 8, Version 6 , GI10-8182. This document includes installation and setup instructions for the DB2 extenders.

DB2 Image, Audio, and Video Extenders for OS/390

DB2 Universal Database for OS/390 Version 6 Image, Audio, and Video Extenders Administration and Programming, SC26-9650. This book describes how to administer a DB2 for OS/390 database server for text data. It also describes how to use user-defined functions and application programming interfaces that are provided by the DB2 for OS/390 Image, Audio, and Video Extenders to access and manipulate such data.

DB2 Universal Database Version 6. This is the workstation version of DB2.

DB2 Universal Database Application Development Guide, Version 6, SC09-2845. Refer to this book for a description of how to prepare on a workstation client an application program that uses embedded SQL.

DB2 Universal Database CLI Guide and Reference, Version 6, SC09-2843. Refer to this book for a description of how to prepare on a workstation client an application program that uses CLI calls.

DB2 Universal Database Extenders Version 6. This is the workstation version of the DB2 extenders. It supports workstation clients and servers.

DB2 Universal Database Image, Audio, and Video Extenders Administration and Programming, Version 6 , SC26-9645. This book describes how to administer a DB2 UDB Version 6 database for image, audio, and video data. It also describes how to use application programming interfaces that are provided by the DB2 Image, Audio, and Video Extenders Version 6 to access and manipulate image, audio, and video data.

DB2 Universal Database Text Extender Administration and Programming, Version 6 , SC26-9646. This book describes how to administer a DB2 UDB Version 6 database for text data. It also describes how to use application programming interfaces that are provided by the DB2 Text Extender Version 6 to access and manipulate text data.

World Wide Web

DB2 extenders Web site. This Web site contains information about the DB2 extenders. The URL of the DB2 extenders home page is: http://www.software.ibm.com/data/db2/extenders.

How to send your comments

Your feedback is important in helping to provide the most accurate and high-quality information. If you have any comments about this book:

- Visit our home page at:

  `http://www.software.ibm.com/data/db2/extenders`

  There you will find the feedback page where you can enter comments and send them.
- Send your comments by e-mail to swsdid@de.ibm.com, or to the IBMMAIL address DEIBM3P3@IBMMAIL. Be sure to include the name of the book, the part number of the book, the version of the product, and, if applicable, the specific location of the text you are commenting on (for example, a page number or table number).
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Part 1. Guide

Chapter 1. An overview of DB2 extenders

Text Extender is one of a family of DB2 extenders. It enables programmers to include SQL queries for text documents in their applications.

The other extenders can search for images, video and voice data.

Text Extender

Text Extender adds the power of full-text retrieval to SQL queries by making use of features available in DB2 UDB for OS/390 that let you store unstructured text documents of up to 2 gigabytes in databases.

Text Extender offers DB2 UDB for OS/390 users and application programmers a fast, versatile, and intelligent method of searching through such text documents. Text Extender's strength lies in its ability to search through many thousands of large text documents at high speed, finding not only what you directly ask for, but also word variations and synonyms.

You are not restricted to searching only in text documents stored in DB2 UDB for OS/390 databases, you can also search in text documents stored in files.

Text Extender can access any kind of text document, including word-processing documents in their original native form, and offers a rich set of retrieval capabilities including word, phrase, wildcard, and proximity searching using Boolean logic.

At the heart of Text Extender is IBM's high-performance linguistic search technology. It allows your applications to access and retrieve text documents in a variety of ways. Your applications can:

- Search for documents that contain specific text, synonyms of a word or phrase, or sought-for words in proximity, such as in the same sentence or paragraph.
- Do wildcard searches, using front, middle, and end masking, for word and character masking.
- Search for documents of various languages in various document formats.
- Make a "fuzzy" search for words having a similar spelling as the search term. This is useful for finding words even when they are misspelled.
- Make a free-text search in which the search argument is expressed in natural language.
- Search for words that sound like the search term.

Text Extender

You can integrate your text search with business data queries. For example, you can code an SQL query in an application to search for text documents that are created by a specific author, within a range of dates, and that contain a particular word or phrase. Using the Text Extender programming interface, you can also allow your application users to browse the documents.

By integrating full-text search into DB2 UDB for OS/390's SELECT queries, you have a powerful retrieval function that combines attribute and full-text search. The following SQL statement shows an example:

```
SELECT * FROM MyTextTable
  WHERE version = '2'
  AND DB2TX.CONTAINS (
              DB2BOOKS_HANDLE,
              '"authorization"
                IN SAME PARAGRAPH AS "table"
                AND SYNONYM FORM OF "delete"') = 1
```

DB2TX.CONTAINS is one of several Text Extender search functions. DB2BOOKS_HANDLE is the name of a handle column referring to column DB2BOOKS that contains the text documents to be searched. The remainder of the statement is an example of a search argument that looks for `authorization`, occurring in the same paragraph as `table`, and `delete`, or any of `delete`'s synonyms.

Other DB2 Extenders

The other extenders in the family let you search for a combination of image, video, and voice data types *in one SQL query*.

As with Text Extender, these extenders define new data types and functions using DB2 UDB for OS/390's built-in support for user-defined types and user-defined functions. You can couple any combination of these data types, that is, image, audio, and video, with a text search query.

The extenders exploit DB2 UDB for OS/390's support for large objects of up to 2 gigabytes, and for triggers that provide integrity checking across database tables ensuring the referential integrity of the multimedia data.

Image Extender

With the Image Extender, your applications can:

- Import and export images and their attributes into and out of a database
- Control access to images with the same level of protection as traditional business data
- Select and update images based on their format, width, and height

- Display miniature images and full images.

You can integrate an image query with traditional business database queries. For example, you can program an SQL statement in an application to return miniature images of all pictures whose width and height are smaller than 512 x 512 pixels and whose price is less than $500, and also list the names of each picture's photographer. Using the Image Extender, you can also allow your application users to browse the images.

Video Extender

With the Video Extender, your applications can:

- Import and export video clips and their attributes to and from a DB2 UDB for OS/390 database
- Select and update video clips based on video attributes such as compression method, length, frame rate, and number of frames
- Retrieve specific shots in a video clip through shot detection
- Play video clips.

You can integrate a video query with traditional business database queries. For example, you can code an SQL statement in an application to return miniature images and names of the advertising agencies of all commercials whose length is less than 30 seconds, whose frame rate is greater than 15 frames a second, and that contain remarks such as "OS/2 Warp" in the commercial script. Using the Video Extender, you can also allow your application users to play the commercials.

Audio Extender

With the Audio Extender, your applications can:

- Import and export audio clips and their attributes to and from a DB2 UDB for OS/390 database
- Select and update audio clips based on audio attributes, such as number of channels, length, and sampling rate
- Play audio clips.

The Audio Extender supports a variety of audio file formats, such as WAVE and MIDI. Like the Video Extender, the Audio Extender works with different file-based audio servers.

Using the Audio Extender, your applications can integrate audio data and traditional business data in a query. For example, you can code an SQL statement in an application to retrieve miniature images of compact disk (CD) album covers, and the name of singers of all music segments on the CD

whose length is less than 1 minute and that were produced in 1990. Using the Audio Extender, you can also allow your application users to play the music segments.

Text Extender in the DB2 client/server environment

Figure 1 shows how Text Extender is integrated into the DB2 client/server environment.

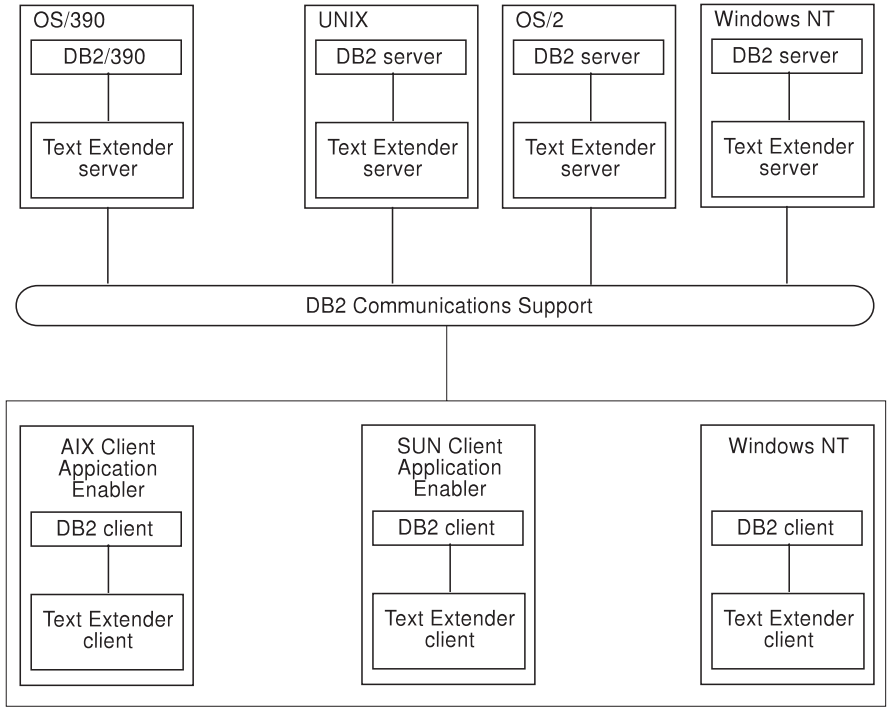


Figure 1. Integration of Text Extender into the DB2 client/server environment

For a list of the DB2 Communications Support protocols (such as TCP/IP or NETBIOS) for a client , see the *DB2 Quick Beginnings Guide* for the appropriate platform.

The main part of Text Extender is installed on the same machine as the DB2 server. Only one Text Extender server instance can be installed with one DB2 server instance.

A Text Extender installation is flexible and can comprise:

- One or several Text Extender servers on any of the operating systems shown in Figure 1 on page 6, where UNIX includes AIX, SUN-Solaris, and HP-UX workstations.
- AIX, SUN-Solaris, HP-UX, OS/2, Windows 98, or Windows 95, Windows NT clients with access to one or several remote Text Extender servers
- AIX clients containing a local server and having access to remote servers.

Figure 2 shows a typical Text Extender configuration. To run Text Extender from a client, you must first install a DB2 client and some Text Extender utilities. These utilities constitute the Text Extender "client" although it is not a client in the strict sense of the word. The client communicates with the server via the DB2 client connection.

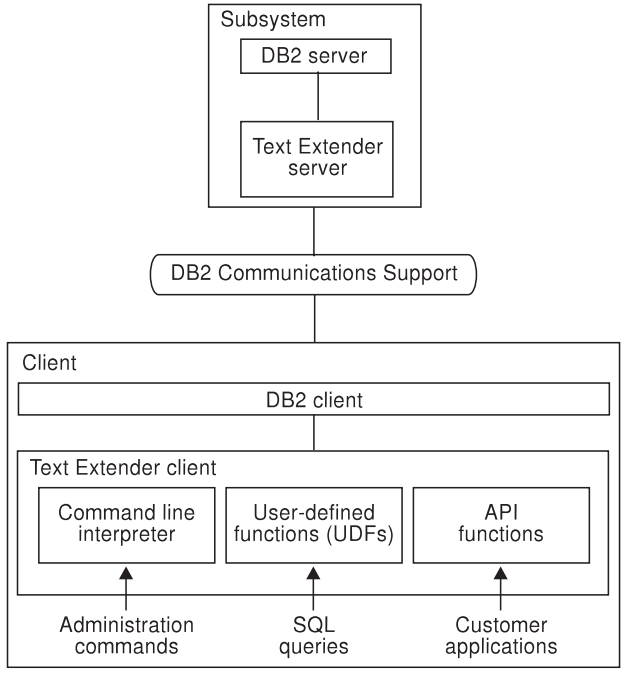


Figure 2. A Text Extender configuration

Text Extender has the following main components:

- **A command line interpreter.** Commands are available that let you prepare text in columns for searching, and maintain text indexes.
- **User-defined functions (UDFs).** Functions are available that you can include in SQL queries for searching in text, and finding, for example, the number of times the search term occurs in the text. For clarity, the figure shows the UDFs on the client because they can be used as part of an SQL

query. In fact, they are part of the server installation and are executed there. However, the UDFs can be used from any DB2 client without the need to install the Text Extender client.

- **An application programming interface (API)** consisting of functions that can be called in C programs for searching in text and displaying the search results.

Tip

The Text Extender client utilities offer the two main functions: administration and the API. (The UDFs are available on the server.)

To use the Text Extender administration functions or the API on the client, you must install the Text Extender client. If you do Text Extender administration only at the Text Extender server, then you need to install the Text Extender client utilities only on clients that use the API functions.

If you need only the search capability on the client using DB2 UDB for OS/390 SQL statements, you do not need to install the Text Extender client. All communication is handled by DB2 UDB for OS/390 and the Text Extender search engine runs only on the server.

Chapter 2. Planning a text index

Before you begin the steps described in "Chapter 4. Administration" on page 37, you must decide whether to create a common text index, or to create individual indexes, one for each text column. This chapter helps you to make this decision, and to calculate approximately how much disk space you will need for text indexes.

There are several types of index to choose from: linguistic, precise, dual, and Ngram. The choice of index type is significant. For example, if you choose *linguistic* as the index type, you can search for word variations and synonyms of the search term. The index type also affects indexing performance and the size of the index. You can also make use of the search capabilities of more than one index type by creating several indexes, each having a different index type, per text column.

Why text documents need to be indexed

A fast information retrieval system does not sequentially scan through text documents; this would take too long. Instead, it operates on a previously built text index. You can think of a text index as consisting of significant terms extracted from the text documents, each term stored together with information about the document that contains it.

A text index contains only relevant information; insignificant words, such as "and", "of", and "which", are not indexed. Text Extender uses a list of these words, known as *stop words* to prevent them from being indexed. The retrieval system searches through the index for the terms requested to find which text documents contain those terms.

Tip

If you need to modify the list of stop words, do it only once, and at installation time.

A list of stop words per language is stored in a file that you can modify (see "Modifying the stop-word and abbreviation files" on page 43), but, because there is one file for the whole system, you should change it only once while you are setting up Text Extender for the first time. If you change the file later, existing indexes will not reflect the change.

Why text documents need to be indexed

As an example, let's say that some documents contain the name of a weekly magazine called "Now". If you remove this word from the stop words, it will be indexed and can be found by future searches. However, any indexes created before you removed the stop word will not contain the word "now", and a search for it will be unsuccessful.

If you do decide to change the stop words, and you want this change to be reflected throughout, you must recreate all your indexes.

Indexing is a two-step process. The first step is to record in a *log table* the text documents that need to be indexed. This occurs automatically through DB2 *triggers* whenever you insert, update, or delete a text document in a column.

The second step is to index the text documents listed in the log table. This may be done periodically. The terms of those documents that were inserted or changed in the column are added to the index. The terms of those documents that were deleted from the column are removed from the index.

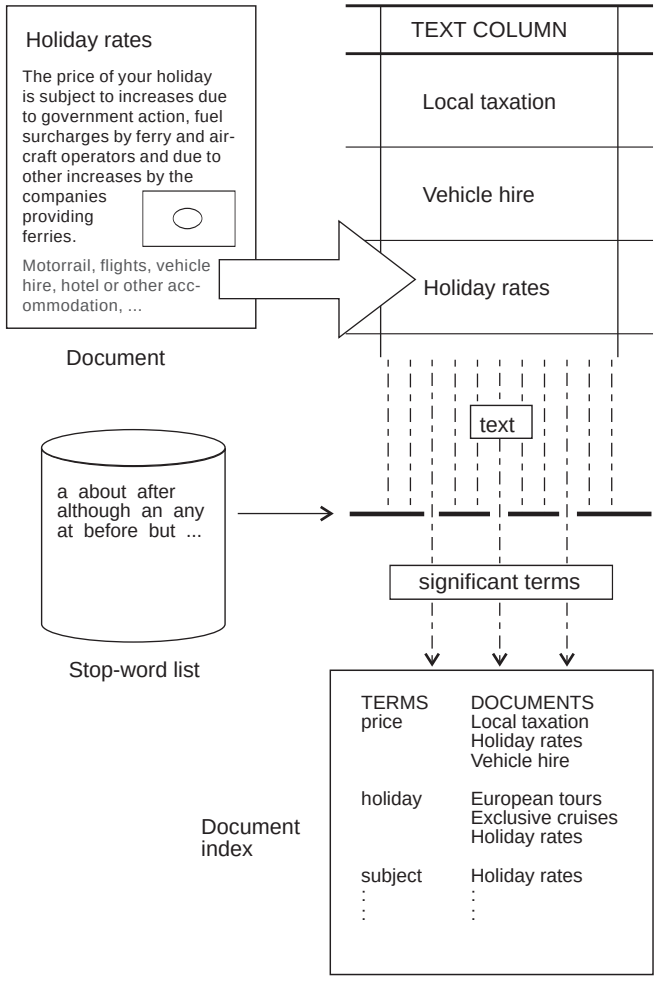


Figure 3. Indexing only significant terms

Types of index

You can assign one of these index types to a column containing text to be searched: *linguistic*, *precise*, *dual*, and *Ngram*. You must decide which index type to create before you prepare any such columns for use by Text Extender. For a more detailed description of how each type of index affects linguistic processing, read "Chapter 3. Linguistic processing" on page 17.

Tip

Text Extender offers a wide variety of search options, though not all are available for all index types. See Table 6 on page 178 and Table 7 on page 179 before making your decision about which index type to use.

Linguistic index

For a linguistic index, linguistic processing is applied while analyzing each document's text for indexing. This means that words are reduced to their base form before being stored in an index; the term "mice", for example, is stored in the index as `mouse`.

For a query against a linguistic index, the same linguistic processing is applied to the search terms before searching in the text index. So, if you search for "mice", it is reduced to its base form `mouse` before the search begins. Table 1 on page 17 summarizes how terms are extracted for indexing when you use a linguistic index.

The advantage of this type of index is that any variation of a search term matches any other variation occurring in one of the indexed text documents. The search term `mouse` matches the document terms "mouse", "mice", "MICE" (capital letters), and so on. Similarly, the search term `Mice` matches the same document terms.

This index type requires the least amount of disk space. However, indexing and searching can take longer than for a precise index.

The types of linguistic processing available depend on the document's language. See "The supported languages" on page 25 for details. Here is a list of the types:

- Word and sentence separation.
- Sentence-begin processing.
- Dehyphenation.
- Normalizing terms to a standard form in which there are no capital letters, and in which accented letters like "ü" are changed to a form without accents. For example, the German word "Tür" (door) is indexed as `tuer`.
- Reducing terms to their base form. For example, "bought" is indexed as `buy`, "mice" as `mouse`.

Tip

Word fragments (words masked by wildcard characters) cannot be reduced to a base form. So, if you search for `swu%`, you will not find the word "swum", because it is reduced to its base form in the index. To find it, you must search for `swi%`.

- Word decomposition, where compound words like the German "Wetterbericht" (weather report) are indexed not only as `wetterbericht`, but also as `wetter` and `bericht`.
- Stop-word filtering in which irrelevant terms are not indexed. "A report about all animals" is indexed as `report` and `animal`.
- Part-of-speech filtering, which is similar to stop-word filtering; only nouns, verbs, and adjectives are indexed. "I drive my car quickly" is indexed as `drive` and `car`. The words "I" and "my" are removed as stop words, but additionally the adverb "quickly" is removed by part-of-speech filtering.

Precise index

In a precise index, the terms in the text documents are indexed exactly as they occur in the document. For example, the search term `mouse` can find "mouse" but not "mice" and not "Mouse"; the search in a precise index is case-sensitive.

In a query, the same processing is applied to the query terms, which are then compared with the terms found in the index. This means that the terms found are exactly the same as the search term. You can use masking characters to broaden the search; for example, the search term `experiment*` can find "experimental", "experimented", and so on.

Table 2 on page 18 gives some examples of how terms are extracted from document text for indexing when you use a precise index.

The advantage of this type of index is that the search is more precise, and indexing and retrieval is faster. Because each different form and spelling of every term is indexed, more disk space is needed than for a linguistic index.

The linguistic processes used to index text documents for a precise index are:

Word and sentence separation

Stop-word filtering.

Dual index

A dual index is a combination of precise and linguistic indexes. It contains the normalized form (standard form in all lower-case letters, and without accents), the base form, such as the infinitives of verbs, and the precise form of each term.

This index type allows the user to decide for each search term whether to search linguistically or precisely.

In a query, you can choose the processing that is applied to the query terms:

- Linguistic search (STEMMED FORM OF option); any form and any case of a search term matches any other form and any other case in a text document.
- Precise search (PRECISE FORM OF option); only the exact form and exact case matches are searched for.

This index type needs the most disk space. Indexing and searching are slower than for a linguistic index. It is not recommended for a large number of text documents.

Tip

In a dual index, word fragments are always looked for as in a precise index; the result is that matching for word fragments is case sensitive.

Ngram index

An Ngram index analyzes text by parsing sets of characters. This analysis is not based on a dictionary.

If your text contains DBCS characters, you must use an Ngram index. No other index type supports DBCS characters.

This index type supports "fuzzy" search, meaning that you can find character strings that are similar to the specified search term. For example, a search for `Extender` finds the mistyped word `Extendrrs`. You can also specify a required degree of similarity.

Note: Even if you use fuzzy search, the first three characters must match.

To make a case-sensitive search in an Ngram index, it is not enough to specify the PRECISE FORM OF keyword in the query. This is because an Ngram index normally does not distinguish between the case of the characters indexed. You can make an Ngram index case-sensitive, however, by specifying

the CASE_ENABLED option when the index is created. Then, in your query, specify the PRECISE FORM OF keyword.

When the CASE_ENABLED option is used, the index needs more space, and searches can take longer.

The SBCS CCSIDs supported by Ngram indexes are 819, 850, and 1252. The DBCS CCSID's supported by Ngram indexes are: 932, 942, 943, 948, 949, 950, 954, 964, 970, 1363, 1381, 1383, 1386, 4946, and 5039.

Although the Ngram index type was designed to be used for indexing DBCS documents, it can also be used for SBCS documents. However, it supports only TDS documents.

Note also that not all of the search syntax options are supported. See the summary of rules and restrictions in "Chapter 10. Syntax of search arguments" on page 173.

Changing the text index type

If you decide that the index type you are using is not suitable, you can change it. When you do so, however, the existing index is deleted, an empty index is created, and entries for all the text documents in the column are added to the log table for reindexing. The command that lets you do this is "CHANGE INDEX SETTINGS" on page 109.

You can choose to have the documents reindexed immediately or the next time periodical indexing occurs.

Creating one or several text indexes for a table

"Chapter 4. Administration" on page 37 describes how to prepare tables so that you can search in them for text. Before you do this preparation, however, you must decide to create either one text index that is common to all indexed text columns in a table, or several text indexes, one for each indexed text column.

Having a separate text index for each text column (a multi-index table) offers flexibility; you can create a different index type for each text column. This flexibility also applies to the other characteristics that are associated with a text column; that is, when its index is periodically updated, and in which directory the index is stored. See "ENABLE TEXT COLUMN" on page 122 for a description of these characteristics. Indexing can be a time- and

resource-consuming activity. By having a multi-index table, you can spread this activity over a period of time by indexing the columns at different times.

If you do not need the flexibility offered by a multi-index table, a common index makes Text Extender easier to maintain.

Tip

If you intend to index external files (see "Enabling external text files" on page 55), the associated table must be a multi-index table.

Calculating the size of an index

The disk space you need for an index depends on the size and type of data to be indexed, and on the index type. Text documents written with word processors need less space because much of their content is taken up with control characters. As a guideline, reserve disk space for about 0.7 times the size of the documents being indexed, then multiply this by 2 to reserve temporary space for reorganizing the index.

If you have several large indexes, you should store them on separate disk devices, especially if you have concurrent access to the indexes during index update or search.

Chapter 3. Linguistic processing

Text Extender offers linguistic processing in these areas of retrieval:

- **Indexing**. When Text Extender analyzes documents to extract the terms to be stored in the text index, the text is processed linguistically to extract the right terms for the index. This is done to make retrieval as simple and as fast as possible.
- **Retrieval**. When Text Extender searches through the document index to find the documents that contain occurrences of the search terms you have specified, the search terms are also processed linguistically to match them with the indexed terms.
- **Browsing**. When you browse a document that has been found after a search, linguistic processing is used to highlight the terms found in the document.

Linguistic processing when indexing

When Text Extender indexes and retrieves documents, it makes a linguistic analysis of the text. As you can see from the following table, the amount of linguistic processing depends on the index type. For Ngram indexes, no linguistic processing is applied.

The linguistic processing used for indexing documents consists of:

- Basic text analysis
  - Recognizing terms (tokenization)
  - Normalizing terms to a standard form
  - Recognizing sentences
- Reducing terms to their base form
- Stop-word filtering
- Decomposition (splitting compound terms).

Table 1 shows a summary of how terms are indexed when the index type is **linguistic** and no additional index properties have been requested.

Table 1. Term extraction for a linguistic index

Document text	Term in index	Linguistic processing
Mouse Käfer	mouse kaefer	Basic text analysis (normalization)

Table 1. Term extraction for a linguistic index (continued)

Document text	Term in index	Linguistic processing
mice swum	mouse swim	Reduction to base form
system-based Wetterbericht	system-based, system base wetterbericht, wetter bericht	Decomposition
a report on animals	report animal	Stop-word filtering. Stop words are: a, on

By comparison, Table 2 shows a summary of how terms are indexed when the index type is **precise.**

Table 2. Term extraction for a precise index

Document text	Term in index	Linguistic processing
Mouse Käfer	Mouse Käfer	No normalization
mice swum	mice swum	No reduction to base form
a report on animals	report animals	Stop-word filtering. Stop words are: a, on
system-based Wetterbericht	system-based Wetterbericht	No decomposition

Basic text analysis

Text Extender processes basic text analysis without using an electronic dictionary.

Recognizing terms that contain nonalphanumeric characters

When documents are indexed, terms are recognized even when they contain nonalphanumeric characters, for example: “$14,225.23”, “mother-in-law”, and “10/22/90”.

The following are regarded as part of a term:

Accents

Currency signs

Number separator characters (like “/” or “·”)

The “@” character in e-mail addresses (English only)

The "+" sign.

Language-specific rules are also used to recognize terms containing:

- Accented prefixes in Roman languages, such as `l'aventure` in French.
- National formats for dates, time, and numbers.
- Alternatives, such as `mission/responsibility`, indicated in English using the "/" character.
- Trailing apostrophes in Italian words like `securita'`. It is usual in typed Italian text, when the character set does not include characters with accents, to type the accent *after* the character; for example, "à" is typed "a'".

Normalizing terms to a standard form

Normalizing reduces mixed-case terms, and terms containing accented or special characters, to a standard form. This is done by default when the index type is linguistic, or when a dual index is used with the search parameter STEMMED FORM OF. (In a precise index the case of letters is left unchanged—searches are case-sensitive.)

For example, the term `Computer` is indexed as `computer`, the uppercase letter is changed to lowercase. A search for the term `computer` finds occurrences not only of `computer`, but also of `Computer`. The effect of normalization during indexing is that terms are indexed in the same way, regardless of how they are capitalized in the document.

Normalization is applied not only during indexing, but also during retrieval. Uppercase characters in a search term are changed to lowercase before the search is made. When your search term is, for example, `Computer`, the term used in the search is `computer`.

Accented and special characters are normalized in a similar way. Any variation of `école`, such as `École`, finds `école`, `Ecole`, and so on. `Bürger` finds `buerger`, `Maße` finds `masse`.

If the search term includes masking (wildcard) characters, normalization is done before the masking characters are processed. Example: `Bür_er` becomes `buer_er`.

Recognizing sentences

You can search for terms that occur in the same sentence. To make this possible, each document is analyzed during indexing to find out where each sentence begins and ends. The end of a sentence is indicated by a period, exclamation mark, or a question mark, followed by a blank character. Many abbreviations ending in a period are ignored.

Linguistic processing when indexing

Reducing terms to their base form (lemmatization)

In a linguistic or a dual index, you can search for `mouse`, for example, and find `mice`. Terms are reduced to their base form for indexing; the term `mice` is indexed as `mouse`. Later, when you use the search term `mouse`, the document is found. The document is found also if you search for `mice`.

The effect is that you find documents containing information about mice, regardless of which variation of the term `mouse` occurs in the document, or is used as a search term.

In the same way, conjugated verbs are reduced to their infinitive; `bought`, for example, becomes `buy`.

Stop-word filtering

Stop words are words such as prepositions and pronouns that occur very frequently in documents, and are therefore not suitable as search terms. Such words are in a stop-word list associated with each dictionary, and are excluded from the indexing process.

Stop word processing is case–insensitive. So a stop word `about` also excludes the first word in a sentence `About`. This is normally not true for an Ngram index which is case insensitive unless it is created using an option making it case sensitive. The stop word lists supplied in various languages can be modified.

Decomposition (splitting compound terms)

Germanic languages, such as German or Dutch, are rich in compound terms, like `Versandetiketten`, which means `mail (Versand) labels (Etiketten)`. Such compound terms can be split into their components.

For a precise index, compound terms are indexed unchanged as one word. For a linguistic or dual index, compound terms are split during indexing. When you search, compound terms are split if you have a linguistic index, or if you use the STEMMED FORM OF option with a dual index.

The components are found if they occur in any sequence in a document as long as they are contained within one sentence. For example, when searching for the German word `Wetterbericht` (weather report), a document containing the phrase `Bericht über das Wetter` (report about the weather) would also be found.

An attempt is made to split a term if:

- The term's language uses compound terms

- The term has a certain minimum length
- The term is not itself an entry in the electronic dictionary—compounds that are commonly used like the German word `Geschäftsbericht` (business report) *are* in the German dictionary.

If a split is found to be possible, the term's component parts are then reduced to their base form. Here are some examples from Danish, German, and Dutch:

Compound term	Component parts
børsmæglerselskab	børsmæglerselskab børs mægler selskab
Kindersprachen	kindersprache kind sprache
probleemkinderen	probleemkinderen probleemkind kind probleem

Linguistic processing for retrieval

Query processing aims at making search terms weaker so that the recall rate of searches is increased, that is, more relevant documents are found. There are two basic operations on query terms to achieve that goal; they are expansions and reductions. In addition, some search term operations involve both expansion and reduction.

- Expansions take a word or a multi-word term from within a search term and associate it with a set of alternative search terms, each of which may be a multi-word term itself. The source expression and the set of target expressions form a Boolean OR-expression in Text Extender's query language. As expansions leave the source term unchanged, they are to some extent independent of the index type. The following are expansion operations:

  Synonym expansion

  Thesaurus expansion

- Reductions change the search term to a form that is more general than the one specified by the user. Because it changes the search term, reductions are dependent on the index type to ensure that the changed term matches. Therefore, Text Extender derives reduction information from the type of those indices or index that the query is directed against. The following are reductions:

  Lemmatization (see "Reducing terms to their base form (lemmatization)" on page 20)

Normalization

Stop words.

- Some operations both change the search term and expand it with a set of alternative terms. Due to the inherent reduction, these again depend on information contained in the index. The following operations fall into this class:

  Character and word masking

  Sound expansion.

Synonyms

Synonyms are semantically related words. Usually, these words have the same word class or classes (such as noun, verb, and so on) as the source term. Synonyms are obtained from a separate file for each language. They are always returned in base form and, up to a few exceptions, are not multi-word terms. Search term words are always reduced to their base form when looking up synonyms. Here are some examples of a word's synonyms in three languages:

- English

  ```
  word:
  comment remark statement utterance term expression
  communication message assurance guarantee warrant bidding command
  charge commandment dictate direction directive injunction instruction
  mandate order news advice intelligence tidings gossip buzz cry
  hearsay murmur report rumor scuttlebutt tattle tittle-tattle
  whispering
  ```

- French

  ```
  mot:
  expression parole terme vocable lettre billet missive epître
  plaisanterie
  ```

- German

  ```
  Wort:
  Vokabel Bezeichnung Benennung Ausdruck Begriff Terminus
  Ehrenwort Brocken Bekräftigung Versprechen Zusicherung Gelöbnis
  Beteuerung Manneswort Schwur Eid Ausspruch
  ```

Thesaurus expansion

A search term can be expanded using thesaurus terms that can be reached through a specific relation. These relations may be hierarchical (such as the "Narrower term" relation), associative (such as a "Related term" relationship), or it may be a synonym relationship. A thesaurus term may be, and often is, a multi-word term.

"Thesaurus concepts" on page 27 describes thesaurus expansion in more detail.

Sound expansion

Sound expansion expands single words through a set of similarly sounding words. It is particularly useful whenever the exact spelling of a term to be searched is not known.

Character and word masking

Masking is a non-linguistic expansion technique, where a regular expression is replaced with the disjunction of all indexed words that satisfy it. Neither a masked expression nor any of its expansions is subject to lemmatization, stop-word extraction, or any of the other expansion techniques. This may have the effect that, for example, an irregular verb form like `swum`, when searched with the masked term `swu*`, is matched on a precise index, but not on a linguistic index, where this form has been lemmatized to become `swim`.

If you use word masking, performance can be slow, especially when searching in large indexes.

Linguistic processing for browsing

Linguistic processing is also used when you browse documents that have been found after a search. It is done in two stages:

1. Basic text analysis: normalization and term expansion
2. Extended matching.

Stage 1: Normalization and term expansion

The first stage is done without using an electronic dictionary.

Normalization

Normalization is described in "Basic text analysis" on page 18.

Term expansion

Term expansion is the inverse of reducing a term to its base form. If the index is linguistic, or if the index is dual and the search argument contains the option for linguistic processing STEMMED FORM OF, then search terms are reduced to their base form before the search begins.

Similarly, if you have a linguistic or a dual index, a document's terms are reduced to their base form before being added to the index. Documents are therefore found on the basis of a term's base form.

When you browse a found document, however, you expect to see all variants of the base form highlighted. To highlight these variants, the found base term is expanded.

All variants (inflections) for each term found in the dictionaries can be produced. These are the inflections produced for the German word `gehen` (to go):

```
gegangen  geh    gehe    gehen    gehend  gehest  gehet  gehst
ging      ginge  gingen  gingest  ginget  gingst  gingt  geht
```

Stage 2: Extended matching

The second stage is extended matching, which can be used on the rare occasions when basic text analysis and normalization cannot highlight a found term. Extended matching finds the more obscure matches.

You choose extended matching by specifying DES_EXTENDED as a parameter in the DesOpenDocument API function.

Extended matching uses the same linguistic processing that is done while linguistically indexing.

These are the occasions when extended matching can find additional matches:

- The search term includes masking characters and is an inflection.

  Masking characters are processed and stem reduction is done for the search term and the corresponding documents are found. Without extended matching, text that matches the specified search criteria would not be highlighted.

  Example: A document contains the inflected term `swam`.

  - During indexing this term is reduced to `swim`.
  - If the search term is `swi%`, the above document is found, because the stem reduction is `swim`.
  - Without extended matching, only those words that match the term `swi%` are highlighted. With extended matching, the inflected term `swam` is also highlighted.

- If compound words have been indexed.

  When a document in a Germanic language contains a compound word and is indexed using a linguistic index, the document index retains the parts of the compound word and the compound word itself. When you search for a part of a compound word, the documents containing the compound word are found, but without extended matching the word is not highlighted.

  Example: A document contains the German word `Apfelbaum` (apple tree).

  - During linguistic indexing, this word is reduced to `apfel` and `baum`.

  - When the index is searched for the term `baum`, the term `Baum` and the document that contains it is found through the index.
  - Without extended matching, no terms are highlighted because the document contains `Apfelbaum`, but not `Baum`. With extended matching, the `Apfelbaum` compound is split and the `Baum` part is found for highlighting.
- If words are hyphenated at the end of a line.

  If the hyphen is inserted automatically by a word processor, the hyphenated word can be found and highlighted. If, however, the hyphen is typed by the user, the documents containing the word are found, but without extended matching the word is not highlighted.

  Example: A document contains the hyphenated word `container`, broken at the end of a line like this:

  ```
  Another name for a folder is a con-
  tainer.
  ```

  - During indexing the word is normalized to `container`.
  - When the index is searched for the term `container`, the term and the document that contains it is found.
  - An attempt is made to highlight any words in the document that match `container`. Without extended matching, a match is found only if the hyphen in `con-tainer` was inserted by the text processor, and not typed by a user.

The supported languages

The following list shows the SBSC languages by Text Extender. Thesaurus expansion, the treatment of proper names, abbreviations, and domain terms is available for US and UK English only. Decomposition is supported for German only. Synonyms are not supported for Norwegian Nynorsk and Bokmal. Only the logical (not the visual) file format for documents written in bidirectional languaes is supported.

Arabic

Brazilian

Canadian French

Catalan

Danish

Dutch

Finnish

French

German

Hebrew

Icelandic

Italian
Norwegian Bokmal
Norwegian Nynorsk
Norwegian Bokmal and Nynorsk
Portuguese
Russian
Spanish
Swedish
Swiss German
UK English
US English

Dictionaries, stop-word lists, and abbreviation lists

The following table shows the supported languages and the names of the files that are provided as dictionaries, stop-word lists, and lists of abbreviations. The dictionary files are in binary format and cannot be changed. The stop-word files and abbreviation files (if they exist) are in flat-file format and can be changed. If you change any of these files, ensure that you use the cocde page for the language.

The files are distinguished by their extension:

Content	Extension
Dictionary	DIC
Stop-word list	STW
Abbreviation list	ABR

Table 3. Linguistic functions used for the various languages

Language	File name	Dictionary	Stop-word list	Abbr. list	Code page
Arabic	arabic	X	X		420
Brazilian Portuguses	brazil	X	X		500
Canadian French	canadien	X	X	X	500
Catalan	catala	X	X		500
Danish	dansk	X	X	X	500
Dutch	nederlnd	X	X	X	500
Finnish	suomi	X	X		500

Table 3. Linguistic functions used for the various languages (continued)

Language	File name	Dictionary	Stop-word list	Abbr. list	Code page
French	francais	X	X	X	500
German	deutsch	X	X	X	500
Hebrew	hebrew	X	X	X	424
Icelandic	islensk	X	X		500
Italian	italiano	X	X	X	500
Norwegian Bokmal	norbook	X	X	X	500
Norwegian Nynorsk	norntn	X	X		500
Portuguese	portugal	X	X		500
Russian	russian	X	X	X	1025
Spanish	espana	X	X	X	500
Swedish	svensk	X	X	X	500
Swiss German	dschweiz	X	X	X	500
UK English	uk	X	X	X	500
US English	us	X	X	X	500

Thesaurus concepts

A thesaurus is a controlled vocabulary of semantically related terms that usually covers a specific subject area. It can be visualized as a semantic network where each term is represented by a node. If two terms are related to each other, their nodes are connected by a link labeled with the relation name. All terms that are directly related to a given term can be reached by following all connections that leave its node. Further related terms can be reached by iteratively following all connections leaving the nodes reached in the previous step. Figure 4 on page 28 shows an example of the structure of a very small thesaurus.

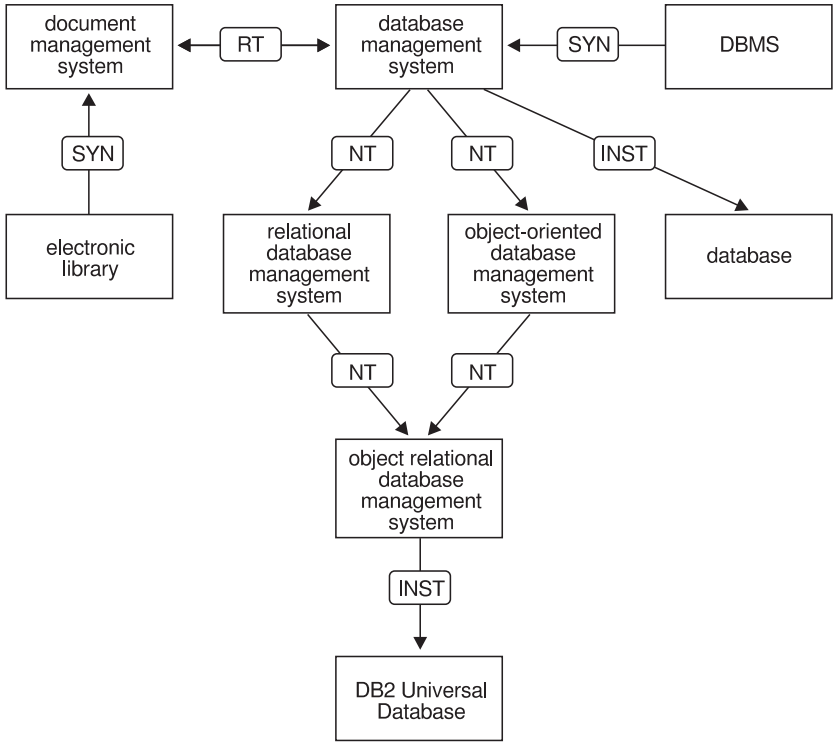


Figure 4. A thesaurus displayed as a network

Text Extender lets you expand a search term by adding additional terms from a thesaurus that you have previously created. Refer to "Chapter 10. Syntax of search arguments" on page 173 to find out how to use thesaurus expansion in a query.

To create a thesaurus for using it in a search application requires a thesaurus definition file that has to be compiled into an internal format, the thesaurus dictionary.

The basic components of a thesaurus are "terms" and "relations".

Terms

A term is a word or expression denoting a concept within the subject domain of the thesaurus. For example, the following could be terms in one or more thesauri:

```
data processing
helicopter
gross national product
```

In a Text Extender thesarus, terms are classified as either descriptors or nondescriptors. A *descriptor* is a term in a class of synonyms that is the preferred term for indexing and searching. The other terms in the class are called *nondescriptors*. For example, `outline` and `shape` are synonymous, where `shape` could be the descriptor and `outline` a nondescriptor.

An Ngram thesaurus does not distinguish between descriptors and nondescriptors.

Relations

A relation is an expression of an association between two terms. Relations have the following properties:

- The *depth* of a relation is the number of levels over which the relation extends. This is specified in the search syntax using the THESDEPTH keyword. Refer to "Chapter 10. Syntax of search arguments" on page 173 to find out how to use thesaurus expansion in a query.
- The *directionality* of a relation specifies whether the relation is true equally from one term to the other (bidirectional), or in one direction only (unidirectional).

Thesaurus expansion can use every relation defined in the thesaurus. You can also specify the depth of the expansion. This is the maximum number of transitions from a source term to a target term. Note however that the term set may increase exponentially as the depth is incremented.

The following example shows those terms that are newly added as the depth increases.

```
health

health service, paramedical, medicine, illness

allergology, virology, veterinary medicine, toxicology, surgery,
stomatology, rhumatology, radiotherapy, psychiatry, preventive
medicine, pathology, odontology, nutrition, nuclear medicine,
neurology, nephrology, medical check up, industrial medicine,
hematology, general medicine, epidemiology, clinical trial,
cardiology, cancerology
```

Text Extender thesaurus relations

These are the relation types provided by a Text Extender thesaurus:

- Associative
- Synonymous
- Hierarchical
- Other

In a Text Extender thesaurus there are no predefined relations. You can give each relation a name, such as BROADER TERM, which can be a mnemonic abbreviation, such as BT. The common relations used in thesaurus design are:

- BT or BROADER TERM
- NT or NARROWER TERM
- RT or RELATED TERM
- SYN or SYNONYM
- USE
- UF or USE FOR

Associative: An associative relation is a bidirectional relation between descriptors, extending to any depth. It binds two terms that are neither equivalent nor hierarchical, yet are semantically associated to such an extent that the link between them may suggest additional terms for use in indexing or retrieval.

Associative relations are commonly designated as RT (related term). Examples are:

dog RT security

pet RT veterinarian

Synonymous: When a distinction is made between descriptors and nondescriptors, as it is in a Text Extender thesaurus, the synonymous relation is unidirectional between two terms that have the same or similar meaning. In a class of synonyms, one of the terms is designated as the descriptor. The other terms are then called nondescriptors.

The common designation USE leads from a given nondescriptor to its descriptor. The common designation USE FOR leads from the descriptor to each nondescriptor.

feline USE cat

lawyer UF advocate

Hierarchical: A hierarchical relation is a unidirectional relation between descriptors that states that one of the terms is more specific, or less general, than the other. This difference leads to representation of the terms as a hierarchy, where one term represents a class, and subordinate terms refer to its member parts. For example, the term “mouse” belongs to the class “rodent”.

BROADER TERM and NARROWER TERM are hierarchical relations. For example:

car NT limousine

equine BT horse

Other: A relation of type *other* is the most general. It represents an association that does not easily fall into one of the other categories. A relation of type *other* can be bidirectional or unidirectional, there is no depth restriction, and relations can exist between descriptors and nondescriptors.

This relation is often used for new terms in a thesaurus until the proper relation with other terms can be determined.

Of course you can define your own bidirectional synonymous relation by using the relation type *associative* for a synonymous relation between descriptors or even with the relation type *other* for a synonymous relation between arbitrary terms.

Creating a thesaurus

There is a sample English thesaurus compiler input file `desthes.sgm` stored in the samples directory of the installation path. The dictionary directory on OS/2 and Windows systems is:

```
drive:\dmb\db2tx\samples
```

On AIX, HP-UX, and SUN-Solaris systems, the directory is:

```
DB2TX_INSTOWNER /db2tx/samples
```

A compiled version of this thesaurus and its SGML input file is stored in the dictionary directory.

```
drive:\dmb\db2tx\dict
or
DB2TX_INSTOWNER /db2tx/dicts
```

The files belonging to this thesaurus are called `desthes.th1`, `desthes.th2`, ..., and `desthes.th6`..

To create a thesaurus, first define its content in a file. It is recommended that you use a plain directory for each thesaurus that you define. The file can have any extension except `th1` to `th6`, which are used for the thesaurus dictionary.

Then compile the file by running:

```
txthesc -f filename -c  ccsid
```

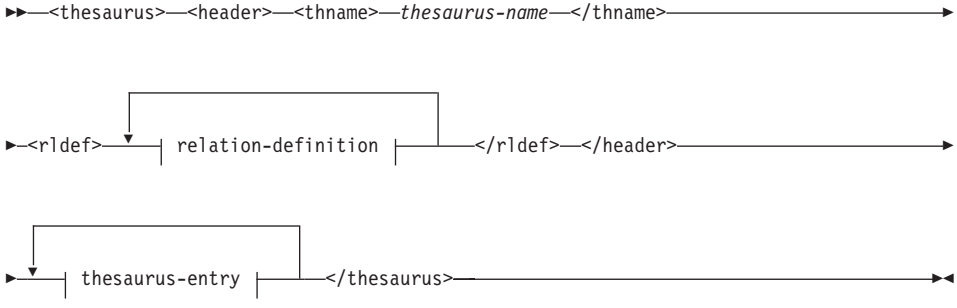
where *filename* can contain only the characters a-z, A-Z, and 0-9.

Currently, only CCSID 850 is supported.

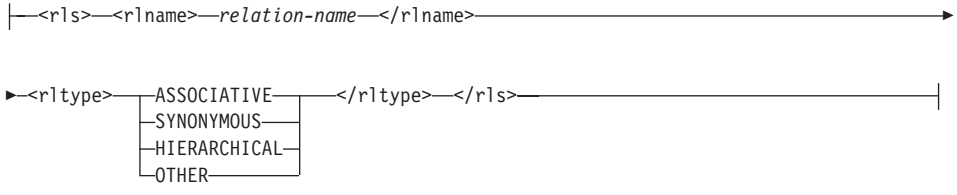
`txthesc` produces thesaurus files having the name *filename* without extension and the extension `th1` to `th6`, in the same directory where the definition file is located. If there is already a thesaurus with the same name, it is overwritten without warning.

Refer to "Chapter 10. Syntax of search arguments" on page 173 to find out how to use a thesaurus in a query.

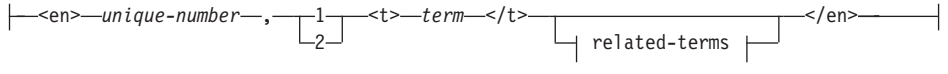
Specify the content of a thesaurus using the Standard Generalized Markup Language (SGML). The following diagram shows the syntax rules to follow when creating a thesaurus.



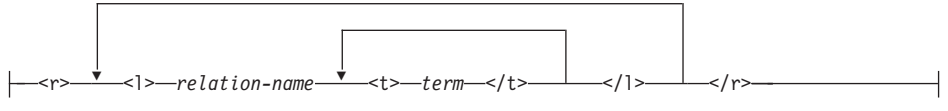
relation-definition:



thesaurus-entry:



related-terms:



relation-name can contain only the characters a-z, A-Z, and 0-9.

Figure 5 on page 34 shows the SGML definition of the thesaurus shown in Figure 4 on page 28.

```
<thesaurus>
<header>
<thname>thesc example thesaurus</thname>
<rldef>

<rls>
<rlname>Related Term</rlname>
<rltype>associative</rltype>
</rls>

<rls>
<rlname>Narrower Term</rlname>
<rltype>hierarchical</rltype>
</rls>

<rls>
<rlname>Instance</rlname>
<rltype>hierarchical</rltype>
</rls>

<rls>
<rlname>Synonym</rlname>
<rltype>synonymous</rltype>
</rls>
</rldef>
</header>

<en> 2, 1
<t>database management system</t>
<r>
  <l>Narrower Term
  <t>oo database management system</t>
  <t>relational database management system</t>
  </l>

  <l>Synonym
  <t>DBMS</t>
  </l>

  <l>Related Term
  <t>document management system</t>
  </l>

  <l>Instance
  <t>database</t>
  </l>
</r>
</en>
```

Figure 5. The definition of a simple thesaurus (Part 1 of 2)

```
<en> 5, 1
<t> relational database management system </t>
<r>
  <l>Narrower Term
  <t>object relational database management system</t>
  </l>
</r>
</en>

<en> 3, 1
<t>object relational database management system</t>
<r>
  <l>Instance
  <t>DB2 Universal Database</t>
  </l>
</r>
</en>

<en> 6, 1
<t>object oriented database management system</t>
<r>
  <l>Narrower Term
  <t>object relational database management system</t>
  </l>
</r>
</en>

<en> 4, 1
<t>document management system</t>
<r>
  <l>Synonym
  <t>library</t>
  </l>
</r>
</en>

<en> 9, 1
<t>library</t>
</en>

<en> 10, 1
<t>DB2 Unversal Database</t>
</en>

<en> 11, 1
<t>database</t>
</en>
</thesaurus>
```

Figure 5. The definition of a simple thesaurus (Part 2 of 2)

Chapter 4. Administration

This chapter begins with a short section on managing a Text Extender server, but is mainly concerned with the administration of Text Extender clients. It describes how to prepare text documents for use by Text Extender, and how to maintain text indexes. This chapter assumes that the text documents you intend to search for are already stored in one or more table columns.

Creating a Text Extender instance

Before you can start to work with Text Extender, you must create a Text Extender instance. Each instance that you create offers an isolated administration environment in which you can maintain indexes, storing them in separate directories.

To create an instance, enter:

```
txicrt
```

The command to drop an instance is:

```
txidrop
```

Managing a Text Extender server

Use the Text Extender server administration commands to do the following:

- Start the server
- Display the status of the server
- Stop the server.

Start the server

To start the server, enter the following command:

```
txstart
```

Display the status of the server

To display the status of the server, enter the following command:

```
txstatus
```

Stop the server

To stop the server, enter the following command:

```
txstop
```

Overview of the client administration tasks

Text Extender must already be started at the server before you can use the client administration commands. If you are in doubt, ask an administrator to check whether Text Extender has been started by entering `txstatus` at the server where the Text Extender instance is installed.

If you have just installed Text Extender, do the tasks in this chapter in sequence, up to and including "Enabling a text column" on page 49. The remainder of the sections concern index maintenance.

Each task includes a summary showing when to do it, the command to use, and the required authorization. Refer to "Chapter 7. Administration commands for the client" on page 107 for a description of the command parameters.

You do the client administration tasks by entering commands at the operating system prompt. These are similar to DB2 commands, but instead of preceding them with `db2`, you precede them with `db2tx`.

Administration overview

- Starting administration:

  Do these tasks before any of the other administration tasks:

  1. Start the Text Extender command line processor (optional)
  2. Connect to a subsystem (optional)

- Preparing text documents for searching:

  Do these tasks in the sequence shown before you search:

  1. Change the text configuration (optional)
  2. Modify the stop-word and abbreviation files (optional)
  3. Modify the document model file (optional)
  4. Enable a server for use by Text Extender
  5. Enable a text table for use by Text Extender (optional)
  6. Enable a text column for use by Text Extender
  7. Enable external text files for use by Text Extender (optional)

- Reversing the text preparation process:

Disable a text column from use by Text Extender
Disable external text files from use by Text Extender
Disable a text table from use by Text Extender
Disable a server from use by Text Extender

- Maintaining text indexes:
  Update an index
  Change the settings of an index
  Reset the status of an index
  Delete index events
- Getting information:
  Display enabled status information
  Display the settings of the environment variables
  Display the text configuration settings
  Display the index status
  Display error events
  Display the index settings
  Display the text settings for a column
- Working with the Text Extender catalog view
- Tracing errors
- Backing up and restoring indexes and enabled servers

Before you begin

Tip
If you are not a Text Extender instance owner, refer to "Chapter 14. Configuration" on page 233 to find out how to set up your profile.

During these administration steps, you make decisions based on your knowledge of Text Extender concepts. So before you begin, you should know the following:

- The concept of *stop word* lists and abbreviation lists, and whether you want to modify them before you begin indexing (see "Why text documents need to be indexed" on page 9).
- Whether to create one index for the whole text table, or a separate index for each text column (see "Creating one or several text indexes for a table" on page 15).
- The CCSIDs, the languages, and the formats of the text in which you intend to search (see "Information about text documents" on page 234), and the

text configuration settings for CCSID, LANGUAGE, and FORMAT that set the default values for these parameters (see "Text characteristics" on page 233).

- The type of text indexes you will use (see "Chapter 2. Planning a text index" on page 9), and the default index type set in the text configuration settings (see "Index characteristics" on page 234).
- The directory where you intend to store indexes and the value of the text configuration setting for DIRECTORY that sets the default value for this parameter (see "Index characteristics" on page 234).
- The default subsystem name in the environment variable DB2DBDFT (see "Environment variables" on page 233).

Starting administration

This section describes what you must do at the start of each administration session.

Starting the Text Extender command line processor (optional)

Summary

When At the beginning of each administration session.

Command
db2tx

Authorization
Any

Enter the following command to start the Text Extender command line processor:

```
db2tx
```

The `db2tx` prompt is displayed; all subsequent commands are interpreted as Text Extender commands.

```
db2tx =>
```

To leave this mode, enter QUIT.

If you leave out this step, you can issue Text Extender commands directly from the operating system prompt by prefixing them with `db2tx`. Here is an example of a command issued from the operating system prompt:

```
db2tx enable server
```

Connecting to a subsystem

Summary

When Optional. To start an administration session with a subsystem other than the default specified in the DB2DBDFT environment variable.

Command
CONNECT

Authorization
CONNECT on the database

Before you can issue further administration commands in a Text Extender session, you must be connected to a subsystem. You can connect to a subsystem explicitly using the Text Extender CONNECT TO command. If you issue an administration command without being connected to a subsystem, Text Extender connects you to the default subsystem specified in the DB2DBDFT environment variable.

```
db2tx "CONNECT TO subsystem"
```

The following is displayed :

```
>------------Database Connection Information ------------<
Subsystem name       = DSN06010 06.01.0000
SQL authorization ID = user-name
```

Note: If you subsequently issue a Text Extender command outside of the command processor by prefixing it with `db2tx`, the current subsystem connection is lost and a new connection is made to the default subsystem.

Preparing text documents for searching

This section describes how to prepare a database so that its text tables can be searched by Text Extender. The steps are:

1. Change the text configuration (optional)
2. Modify the stop-word and abbreviation files (optional)
3. Modify the document model file (optional)
4. Create a sample table (optional)
5. Enable a database for use by Text Extender
6. Enable a text table for use by Text Extender (optional)
7. Enable a text column for use by Text Extender

8. Enable Text Extender to search in external text files (optional).

An extract from the sample table is shown in Table 5 on page 76.

If you have just installed Text Extender, do these steps in sequence.

Changing the text configuration

Summary

When When you want to make different default settings used for creating and updating an index.

Command
CHANGE TEXT CONFIGURATION

Authorization
SELECT

When you create an index, the following parameters described in "Text configuration settings" on page 233, are set for that index:

- Coded character set ID
- Language
- Format
- Index type
- Update frequency
- Index directory
- Update index option
- Commit count

When Text Extender is first installed, default values for these settings are established in the *text configuration*. To display the current text configuration values, see "Displaying the text configuration settings" on page 65.

To change the text configuration to be used as default values when indexes are created, enter:

```
db2tx "CHANGE TEXT CFG USING settings"
```

Examples

To change the default index type and the default index directory for future indexes:

```
db2tx "CHANGE TEXT CONFIGURATION USING
                  INDEXTYPE   precise
                  INDEXOPTION normalized
                  DIRECTORY   DB2TX_INSTOWNER/db2tx/indexes"
```

To change the default update frequency for indexes so that they are updated at 12:00 or 15:00, on Monday to Friday, if there is a minimum of 100 text documents queued:

```
db2tx "CHANGE TEXT CONFIGURATION USING
                  UPDATEFREQ min(100) d(1,2,3,4,5) h(12,15) m(00)"
```

To stop the periodic updating of an index:

```
db2tx "CHANGE TEXT CONFIGURATION USING
                  UPDATEFREQ none"
```

Modifying the stop-word and abbreviation files

Summary

When If possible, only once when Text Extender is first installed. Optional.

Command
Your own editor command

Authorization
None

There is one stop-word file and one abbreviation file per language. To understand the implications of editing these files, see "Why text documents need to be indexed" on page 9.

Tip

Before you begin editing one of these files, make a backup copy.

The stop word and abbreviation files are in:

DB2TX_INSTOWNER/db2tx/dicts

Remove words and abbreviations that you want to be indexed. Add words that you do not want to be indexed.

Modifying the document model file

Summary

When If you intend to work with a document's structure. Optional.

Command
Your own editor command

Authorization
None

You can restrict a search to particular sections of documents. This concept, and the use of a document model file to enable Text Extender to recognise such sections, is described in "Working with structured documents" on page 54.

When a server instance is created, an example of a document model file *desmodel.ini* is created in the server instance directory. There is also an example of a document model for HTML documents in the same file.

Use your own editor to edit document model files.

Later, when you enable the text column that contains the documents, you must specify `INDEXPROPERTY SECTIONS_ENABLED`.

Enabling a server

Summary

When Once for each server that contains columns of text to be searched in.

Command
ENABLE SERVER

Authorization
SYSADM or DBADM

To enable the connected subsystem, enter:

```
db2tx "ENABLE SERVER"
```

This command takes no parameters. It prepares a server for use by Text Extender.

This command also declares user-defined functions (UDFs) and user-defined distinct types (UDTs) to DB2. These are the SQL functions that you use later to search for text. They are described in “Chapter 9. UDTs and UDFs” on page 161 . These declarations apply to all future sessions.

A catalog view, TEXTINDEXES, is created that keeps track of enabled text columns. See “Working with the Text Extender catalog view” on page 70.

This command creates text configuration information for the database, containing default values for index, text, and processing characteristics. They are described in “Text configuration settings” on page 233.

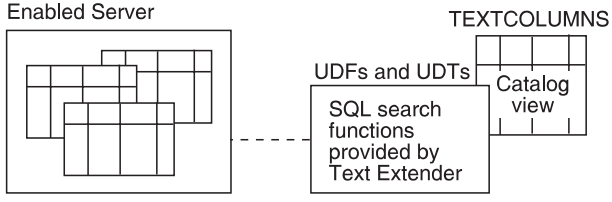


Figure 6. Enabling a server

Once a server has been enabled, it remains so until you disable it. To reverse the changes made by ENABLE SERVER, refer to “Disabling a server” on page 59.

Tips

If the environment variable DB2TX_INSTOWNER is used, it must be set to the name of the instance owner before the server is enabled. This is particularly important for UNIX users because, in UNIX, this variable is set by default.

If you later decide to drop an enabled server, you should first disable it to ensure that the declared UDFs, the catalog view, and so on, are removed.

Enabling a text table

Summary

When Optional. Once to create a common index for all text columns in the table.

Command
ENABLE TEXT TABLE

Authorization
ALTER, SELECT, UPDATE on the table

This step determines whether you have one common index for all the text columns in the table, or several indexes, that is, a separate index for each text column. See "Creating one or several text indexes for a table" on page 15 for further information.

To have a common index, run ENABLE TEXT TABLE, then run ENABLE TEXT COLUMN for each text column. To have separate indexes, skip ENABLE TEXT TABLE, and run only ENABLE TEXT COLUMN for each text column. This is shown in Figure 7 and Figure 8 on page 49.

During this step, Text Extender creates an empty text index that is common to all subsequently enabled text columns. You specify the type of index, how frequently the index is to be updated, and in which directory the index is to be stored. Default values for any parameters that you do not specify are taken from the text configuration settings.

The examples in other chapters assume that the index type is dual.

Tip

If a setting, such as the index update frequency, should be the same for most text tables, it may be more convenient to use text configuration information to specify default settings. See "CHANGE TEXT CONFIGURATION" on page 111.

This step also creates an empty log table for recording which documents in the table are added, changed, or deleted. Triggers are created to keep the log table updated.

You cannot run ENABLE TEXT TABLE for a table that already contains a text column that has been enabled for Text Extender.

To delete an index created by ENABLE TEXT TABLE, see "Disabling a text table" on page 58.

Tip

If you later decide to drop an enabled text table, you should first disable it to ensure that the index, the log table, and so on, are removed.

Examples

The following example enables text table DB2TX.SAMPLE:

```
db2tx "ENABLE TEXT TABLE db2tx.sample"
```

Default values for the index characteristics are taken from the text configuration settings.

The next example explicitly sets the characteristics of the common index that is created for the table.

For an OS/390 server:

```
db2tx "ENABLE TEXT TABLE    db2tx.sample
                 INDEXTYPE  linguistic
                 UPDATEFREQ min(100) d(1,2,3,4,5) h(12,15) m(00)
                 DIRECTORY  DB2TX_INSTOWNER/db2tx/indexes"
```

The example sets the index type and the index directory, and then sets the index update frequency so that the index is updated at 12:00 or 15:00, on Monday to Friday, if there is a minimum of 100 text documents queued.

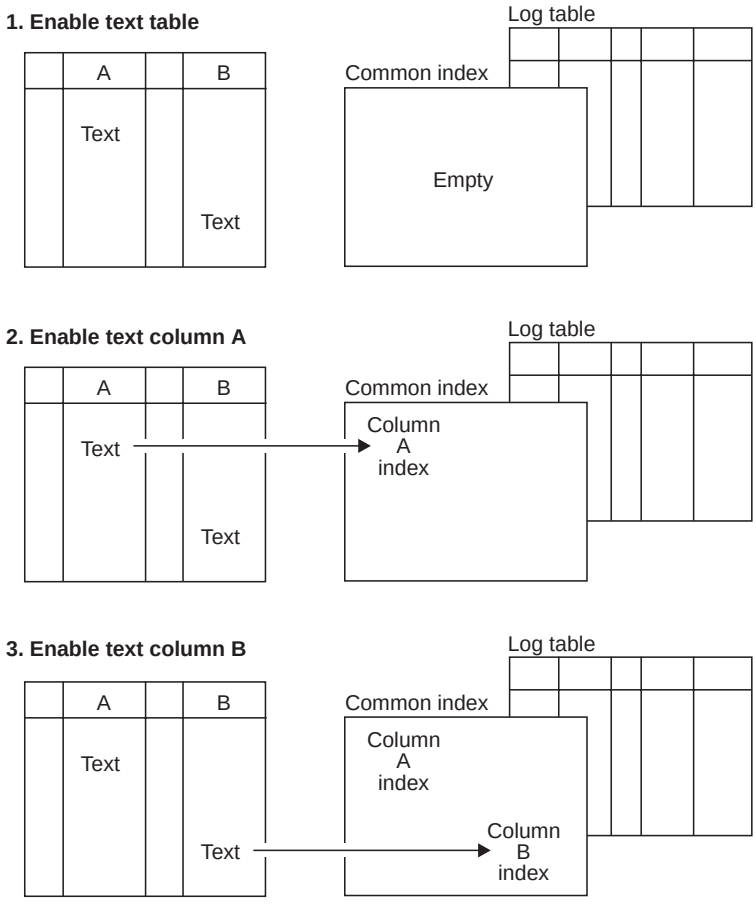


Figure 7. Creating a common index for all text columns in a table

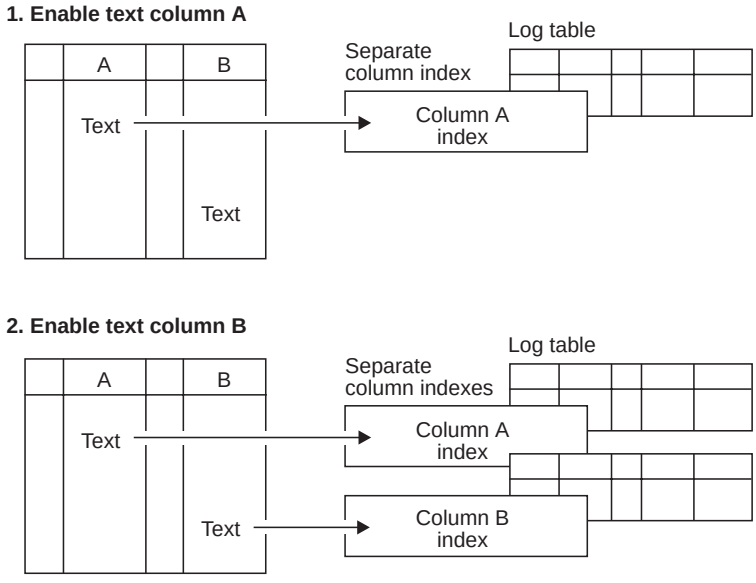


Figure 8. Creating a separate index for each text column

Enabling a text column

Summary

When Once for each column that contains text to be searched.

Command
ENABLE TEXT COLUMN

Authorization
ALTER, SELECT, UPDATE on the table

Tip

If a setting, such as the index update frequency, should be the same for most text columns, use the text configuration information to specify default settings.

To reverse the changes made by ENABLE TEXT COLUMN, use the DISABLE TEXT COLUMN command. To disable all enabled text columns in a table, use the DISABLE TEXT TABLE command.

When you enable a text column, a handle column is added to the table, the document information (format, language, CCSID) is set, a log table is created, and an index is created,

A handle column is added

During this step, Text Extender adds to the table a 60-byte VARCHAR handle column – a column that contains handles associated with the text column that is being enabled. Handles contain information about the text in the associated text column and in the associated external files. This information includes a unique document ID, the document's language, format, and CCSID, and the index name. They are described in "The sample table DB2TX.SAMPLE" on page 76.

DB2TX.SAMPLE

DOCID	AUTHOR	SUBJECT	DATE	COMMENT
Data	Data	Data	Data	Text

Figure 9. Structure of the DB2TX.SAMPLE table—before enabling

The column containing text blocks is COMMENT. Before you can search through the text in this column, you must prepare the database and the COMMENT column for use by Text Extender.

After this preparation step, the DB2TX.SAMPLE table contains an additional column for handles.

DB2TX.SAMPLE

DOCID	AUTHOR	SUBJECT	DATE	COMMENT	COMMENTHANDLE
Data	Data	Data	Data	Text	Text handles

Figure 10. Structure of the DB2TX.SAMPLE table—after enabling

Note: When you subsequently search for text, you specify the handle column, not the text column, as the column to be searched.

The document information is set

You specify the type of text documents you typically store in this text column: their format (such as ASCII), their language, and their CCSID. Defaults for this information can be specified in the text configuration settings. See "Text configuration settings" on page 233.

A log table is created

During this step, a log table and a view called LOGIXnnnnnn is created, where *IXnnnnnn* is the index name (available from the catalog view). If a default tablespace is specified in text configuration, the log table is stored

there; otherwise, it is stored in the DB2 system default tablespace. To optimize performance and the use of disk space, you can specify a different tablespace to be used for the log tables.

Triggers are also created that add information to the log table whenever a document in the column is added or changed. This information causes these documents to be indexed the next time indexing takes place.

If external files are added or changed, these triggers are not aware of the changes. In such cases, to cause the triggers to add the information to the log table, use an UPDATE statement as shown in the example in "Updating an index for external files" on page 60.

If errors occur during indexing, such as when a document queued for indexing could not be found, so-called *error events* are added to the log table and can be displayed, as described in "Displaying error events" on page 67.

Tip

If you run out of log space in this step, see "Enabling a text column in a large table" on page 52 for possible solutions.

In partitioned databases, each table is assigned to a tablespace and a nodegroup. It is important that the log table is assigned to a tablespace that belongs to the same nodegroup as the enabled user table. Text Extender checks this during the ENABLE command.

An index is created

If you intend to have a separate index for each text column, that is, you have skipped the step ENABLE TEXT TABLE, Text Extender creates a separate index for the text column during this step. You specify the type of index, how frequently the index is to be updated, and in which directory the index is to be stored. If, on the other hand, you intend to have one index for the whole table, then you have already run ENABLE TEXT TABLE and specified the index parameters; they are ignored if you repeat them here.

Use the UPDATEINDEX keyword to determine whether the indexing of the text documents in the specified text column begins immediately, or when periodic indexing is next scheduled. If you do not use this keyword, the value specified in the text configuration settings is taken.

Creating indexes of various types for a text column. You can create more than one index for a text column. This can be useful if you want to allow, for example, linguistic and fuzzy search on the same text column, by associating it with different index types, such as linguistic and Ngram indexes. You do

this by running ENABLE TEXT COLUMN again, specifying not only the additional type of index to be created, but also a unique handle column name.

Enabling a text column in a large table

If you are working with a table that has a large row length, keep in mind that enabling a text column adds a handle column of type DB2TEXTH (VARCHAR 60). Similarly, enabling an external file adds a handle column of type DB2TEXTFH (VARCHAR 210). This could be significant if the table is approaching its maximum row length as determined by DB2.

Also when you enable a text column in large table, use the DB2 UDB for OS/390 REORGANIZE utility to check whether the table needs to be reorganized. When you enable a large table for the first time, the following steps make indexing faster:

1. Enable the table using the NOUPDATE option. This creates the handles, but does not yet index the documents.
2. Reorganize the table using the DB2 UDB for OS/390 REORGANIZE utility.
3. Create the index by running UPDATE INDEX.

When you enable a text column or external files, Text Extender adds a handle column to the table and initializes the handle values, thereby causing DB2 UDB for OS/390 log entries to be written. If there is an unusually large number of log entries to be written, DB2 UDB for OS/390 can run out of log space.

Examples

The following example enables text column `COMMENT` in table `DB2TX.SAMPLE`, and assigns the name `COMMENTHANDLE` to the handle column that is created:

```
db2tx "ENABLE TEXT COLUMN    db2tx.sample    comment
                   HANDLE    commenthandle"
```

Default values for the text information and for the index characteristics are taken from the text configuration settings.

The next example explicitly sets the values for the type of documents that are in the `COMMENT` column. Default values for the index characteristics are taken from the text configuration settings.

```
db2tx "ENABLE TEXT COLUMN    db2tx.sample    comment
                   HANDLE    commenthandle
                   CCSID     819
                   LANGUAGE  uk_english
                   FORMAT    rft"
```

The next example explicitly sets the values for the characteristics of the index that is created for the COMMENT column. The example sets the index type and the index directory, and sets the index update frequency so that the index is updated at 12:00 or 15:00, on Monday to Friday, if there is a minimum of 100 text documents queued. Default values for the text information are taken from the text configuration settings.

For an OS/390 server:

```
db2tx "ENABLE TEXT COLUMN     db2tx.sample    comment
                  HANDLE      commenthandle
                  INDEXTYPE   linguistic
                  UPDATEFREQ  min(100) d(1,2,3,4,5) h(12,15) m(00)
                  UPDATEINDEX UPDATE
                  DIRECTORY   DB2TX_INSTOWNER/db2tx/indexes"
```

Enabling text columns of a nonsupported data type

Text columns must be CHAR, GRAPHIC, VARGRAPHIC, LONG VARGRAPHIC, DBCLOB, VARCHAR, LONG VARCHAR, or CLOB to be enabled by Text Extender. If the documents are in a column of a different type, such as a user-defined distinct type (UDT), you must provide a user-defined function that takes the user type as input and provides as output type CHAR, GRAPHIC, VARGRAPHIC, LONG VARGRAPHIC, DBCLOB, VARCHAR, LONG VARCHAR, or CLOB.

Use the FUNCTION keyword in ENABLE TEXT COLUMN to specify the name of this function.

Example: You intend to store compressed text in a table.

1. Create a UDT for the text:

   ```
   db2 CREATE DISTINCT TYPE COMPRESSED_TEXT AS CLOB(1M)
   ```

2. Create a table and insert the text into it:

   ```
   db2 CREATE TABLE MYTEXT (author VARCHAR(50),
                            text   COMPRESSED_TEXT)
   db2 INSERT ...
   ```

To enable the text column for use by Text Extender:

1. Create a UDF called, for example, UNCOMPRESS, that receives a value of type COMPRESSED_TEXT and returns the corresponding uncompressed text as, for example, a CLOB(10M) value.
2. Enable the text column using the FUNCTION keyword to identify the UNCOMPRESS UDF:

   ```
   db2tx "ENABLE TEXT COLUMN MYTABLE  text
                             FUNCTION uncompress
                             HANDLE   handle
                             ..."
   ```

Working with structured documents

A structured document is one that contains sections, such as the document title, author, and subject. You can limit the scope of a search to a particular section of documents.

Structured flat file, and HTML documents are supported. A flat file with marked up sections could look like this:

```
<title>IBM Dictionary of Computing
<author>McDaniel, George
<subject>Computers, Reference, ...
```

Restrictions:

- A dual index cannot be used to take advantage of document structure.
- Ngram indexes do not support the indexing of XML documents.

To make Text Extender aware of such sections when indexing, you must create a *document model* containing descriptive section names of your choice for use in queries against that section, and the markup tags that identify the sections. Often, you will specify a section name that is the same as the tag name:

```
Section  Tag

Title    title
Author   author
Subject  subject
```

The document model file. You describe the document model in a document model *ini* file. Tags that are not defined in the document model file are indexed according to the index type. There is one document model file for each Text Extender server instance. As you can see from the following example, a document model file can contain more than one document model.

```
;Comments must be preceded by a semicolon

[MODELS]
modelname=sample
modelname=play

[sample]
title=title
author=author
subject=subject
content=content

[play]
play=play
author=author
title=title
scene=scene
```

When a server instance is created, an example of a document model file, *desmodel.ini* is created in the server instance subdirectory.

To enable section support, define document models in *desmodel.ini*, and enable the text column that contains the documents using `INDEXPROPERTY SECTIONS_ENABLED`. See "ENABLE TEXT COLUMN" on page 122 for details.

Enabling external text files

Summary

When Optional. Once for each table associated with external files that are to be searched.

Command
ENABLE TEXT FILES

Authorization
ALTER, SELECT, UPDATE on the table

Text Extender can search not only in text stored in DB2 UDB for OS/390 tables, but also in text documents stored in files. This preparation step is needed if you intend to search for text in external files. The table associated with the external text files must not have been enabled by the command ENABLE TEXT TABLE.

An index is created, a log table is created, and the document information is set, in the same way as described in "Enabling a text column" on page 49.

A handle column of type DB2TEXTFH is added to an existing DB2 UDB for OS/390 table. The handle column will hold the references for the external files, each handle containing index and the document information (CCSID, format, and language).

See "Handles for external files" on page 79 for a description.

You can specify additional parameters, such as the default index characteristics, in the same way as for enabling a text column.

After the index has been created, you can move or delete the external files. You can still search on the files. You can insert new rows in the table and use UPDATE INDEX to update the index with the new file references.

If the table you are enabling is using a nodegroup with multiple physical nodes, make sure that the external files you are referencing in the columns of your table are located on the node where the table partition resides.

Examples

1. Create a table DB2TX.EXTFILE having at least one column, or use an existing table.
2. Add handle column FILEHANDLES to table DB2TX.EXTFILE

```
db2tx "ENABLE TEXT FILES  db2tx.extfile
              HANDLE      filehandles
              INDEXTYPE   linguistic
              UPDATEFREQ  min(100) d(1,2,3,4,5) h(12,15) m(00)
              UPDATEINDEX NOUPDATE
              DIRECTORY   /any/db2tx/indices"
```

3. Initialize the handle
   - For each row in a new table:

```
db2 INSERT INTO db2tx.EXTFILE (FILEHANDLES)
VALUES (db2tx.INIT_TEXT_HANDLE
           (850, 'TDS' 'US_ENGLISH',
           '/data/doc1')
```

   - For an existing table, update the handle columns to reflect the external file reference, specifying the name of the external file:

```
db2 UPDATE db2tx.EXTFILE
SET FILEHANDLES = db2tx.file(FILEHANDLES,'/data/doc1')
WHERE DOCID = 'doc1'
```

> **Tip**
> Do not use INIT_TEXT_HANDLE for updating handle columns that refer to external files.

4. Update the index

```
db2tx "UPDATE INDEX  db2tx.extfile
            HANDLE  filehandles"
```

Ending the administration session

You have now completed the steps to prepare your text documents to be searched.

If you specified NOUPDATE for the UPDATEINDEX keyword when you enabled the text column, Text Extender does not index the text immediately, but waits for the next periodic indexing. To update the index now, see "Updating an index" on page 60.

When indexing of the documents has finished, you can begin retrieving information as described in "Chapter 5. Searching with Text Extender UDFs" on page 75.

Enter QUIT to end the Text Extender command processor.

Tip
Use GET INDEX STATUS to determine when indexing has finished.

Reversing the text preparation process

When text is prepared for use by Text Extender, certain administrative changes are made. This section describes functions that help you to reverse this process.

Disabling a text column

Summary

When When you no longer intend to make text searches in a text column.

Command
DISABLE TEXT COLUMN

Authorization
ALTER, SELECT, UPDATE on the table

Example:

```
db2tx "DISABLE TEXT COLUMN db2tx.sample
                           HANDLE commenthandle"
```

When you disable a text column, the following occurs:

- If this is a multi-index table, that is, the column has its own text index and log table, then the index, the log table, and the log table triggers are deleted.
- If this is a common-index table, that is, there is one index shared by all text columns, then the terms for this column's documents are removed from the common index. If this is the only remaining enabled text column in the table, then the index, the log table, and the log table triggers are deleted.

Disabling text files

Summary

When When you no longer intend to make text searches in a set of external text files.

Command
DISABLE TEXT FILES

Authorization
ALTER, SELECT, UPDATE on the table

Example:

```
db2tx "DISABLE TEXT FILES db2tx.sample
                          HANDLE commenthandle"
```

When you disable external text files, the following occurs:

- The index for this handle column is deleted.
- The log table and triggers are deleted.

Disabling a text table

Summary

When When you no longer intend to make text searches in a text table.

Command
DISABLE TEXT TABLE

Authorization
ALTER, SELECT, UPDATE on the table

Example:

```
db2tx "DISABLE TEXT TABLE db2tx.sample"
```

When you disable a text table, the following occurs:

- If there is a common index for the text columns of the table, this index is deleted. If, instead, there are individual indexes for each text column, *all* the indexes for the text columns are deleted.
- The common log table used to automatically record which text documents are to be indexed is deleted. If, instead, there are individual log tables for each text column, all the log tables are deleted.
- The triggers used to maintain the log tables are deleted.
- The content of the handle columns is set to null.

Disabling a server

Summary

When When you no longer intend to make text searches in this server.

Command
DISABLE SERVER

Authorization
SYSADM or DBADM on the database

To disable the connected subsystem, enter:

```
db2tx "DISABLE SERVER"
```

When you disable a server, the following objects are deleted:

- The Text Extender catalog view that was created when the server was enabled
- The declaration of Text Extender's user-defined functions (UDFs), and user-defined distinct types (UDTs) for this server
- All indexes related to any of this server's text tables or text columns
- The log tables used to automatically record which text documents are to be indexed, and the triggers used to maintain them.

Because handle columns cannot be deleted, and the handle column is of a distinct type, some distinct types are not deleted.

Maintaining text indexes

These are the maintenance tasks:

- Updating an index
- Changing the settings of an index
- Resetting the status of an index
- Deleting index events
- Reorganizing an index.

You can run these tasks at any time and in any sequence.

Updating an index

Summary

When When an index must be updated immediately without waiting for periodic indexing to occur. (See "Enabling a text column" on page 49 and "Changing the settings of an index" on page 61 for information about periodic indexing.)

Command
UPDATE INDEX

Authorization
ALTER, SELECT, UPDATE on the table

This example updates the index for a common-index table:

```
db2tx "UPDATE INDEX db2tx.sample"
```

This example updates the index for a column of a multi-index table:

```
db2tx "UPDATE INDEX db2tx.sample HANDLE commenthandle"
```

Use this command to update the index immediately, without waiting for the next periodic indexing to take place automatically. This is useful when you have added several text documents to a database and want to search them immediately.

Text Extender indexes the text documents in this column (or all columns in the table) that have been inserted or changed, and removes from the index the terms from documents that have been deleted. The log table associated with the index contains information about which documents have been inserted, updated, and deleted.

Updating an index for external files

A log table does not automatically contain information about changes to any external files that you may have indexed (see "Enabling external text files" on page 55), such as replacing a document by a newer version having the same absolute path name. Updates occurring on such files cannot be monitored by Text Extender in log tables because the updates do not occur within the scope of DB2 UDB for OS/390.

To have updates on external files reflected in a Text Extender index, you can do the following:

1. Force a "change" entry to be placed in the log table by issuing an update statement on the corresponding handle column that effectively does nothing:

   ```
   UPDATE table
   SET    filehandlecol = filehandlecol
   WHERE  DB2TX.FILE(filehandlecol) = filename
   ```

   where *filename* is the absolute path name of the external file that was updated.
2. Run UPDATE INDEX to bring the index up to date, including the change made to the external file.

Changing the settings of an index

Summary

When When the update frequency of an index has to be changed.

Command
CHANGE INDEX SETTINGS

Authorization
ALTER, SELECT, UPDATE on the table

Use this command to change the update frequency of an index.

Update frequency

See "Setting the frequency of index updates" on page 240 for more information. If you do not specify an update frequency, the current settings are left unchanged.

Use the UPDATEINDEX keyword to determine whether the indexing of the text documents begins immediately, or when periodic indexing is next scheduled. If you do not use this keyword, the current setting is left unchanged.

Examples

To change the update frequency for the index so that it is updated at 12:00 or 15:00, on Monday to Friday, if there is a minimum of 100 text documents queued:

```
db2tx "CHANGE INDEX SETTINGS db2tx.sample
                  HANDLE     commenthandle
                  UPDATEFREQ min(100) d(1,2,3,4,5) h(12,15) m(00)"
```

To stop the periodic updating of an index:

```
db2tx "CHANGE INDEX SETTINGS db2tx.sample
                  HANDLE     commenthandle
                  UPDATEFREQ none"
```

Resetting the index status

Summary

When When an index can no longer be searched or updated.

Command
RESET INDEX STATUS

Authorization
None

Some situations can occur that prevent you from searching in an index, or from updating it. "Displaying the status of an index" on page 66 describes how to determine if one of these events has occurred. RESET INDEX STATUS reactivates the index so that you can use it again.

This example resets the index status for the index of a common-index table:

```
db2tx "RESET INDEX STATUS db2tx.sample"
```

The syntax lets you reset the index status for a particular text column. This example resets the index status for the index of a multi-index table column:

```
db2tx "RESET INDEX STATUS db2tx.sample HANDLE commenthandle"
```

Deleting index events

Summary

When When you no longer need the messages in an index's log table.

Command
DELETE INDEX EVENTS

Authorization
None

If something prevents you from searching in an index, or from updating it, or if a document cannot be indexed, this is known as an indexing *event*. Information about indexing events is stored in the index's log table. It can help you determine the cause of the problem. When you no longer need these messages, you can delete them.

This example deletes messages from the index of a common-index table:

```
db2tx "DELETE INDEX EVENTS db2tx.sample"
```

The syntax also lets you delete indexing events for a particular text column. This example deletes the messages for the index of a multi-index table column:

```
db2tx "DELETE INDEX EVENTS db2tx.sample HANDLE commenthandle"
```

Reorganizing an index

Summary

When When GET INDEX STATUS indicates that an index should be manually reorganized.

Command
REORGANIZE INDEX

Authorization
None

If a text column is often updated, searching the index can become inefficient. To make searching efficient again, the index has to be *reorganized*. Although Text Extender recognizes when an index needs to reorganized and does so in the background automatically, there may be situations that require an index to be reorganized manually using REORGANIZE INDEX. You can use the command GET INDEX STATUS to find out if an index needs to be reorganized.

Although searches can be made on the index while REORGANIZE INDEX is running, index updates cannot.

This example reorganizes the index of a common-index table:

```
db2tx "REORGANIZE INDEX db2tx.sample"
```

This example reorganizes the index of a multi-index table column:

```
db2tx "REORGANIZE INDEX db2tx.sample HANDLE commenthandle"
```

Getting useful information

This section describes the administration commands for displaying information about:

- The enabled status of databases, tables, columns, and files
- The settings of the environment variables

- The text configuration settings
- The index status
- The error events
- The index settings
- The text settings for a column.

Displaying enabled-status information

Summary

When When you need information about the enabled status of databases, tables, text columns or external files.

Command
GET STATUS

Authorization
None

Enter:

```
db2tx "GET STATUS"
```

Here is an example of the output displayed by GET STATUS. It shows the enabled status of the database, and of any enabled tables, text columns, or text files that it contains.

```
Database is enabled for Text Extender

  Table DB2TX.MYTABLE is enabled as a common-index table

  Table DB2TX.SAMPLE is enabled as a common-index table
     TextColumnName     HandleColumnName
     --------------     ----------------
     COMMENT            COMMENTHANDLE


  Table DB2TX.TEST is enabled as a multi-index table
     TextColumnName     HandleColumnName
     --------------     ----------------
     ABSTRACT1          ABSTRACT1HANDLE
     ABSTRACT2          ABSTRACT2HANDLE
```

Displaying the settings of the environment variables

Summary

When When you need information about the settings of the environment variables.

Command
GET ENVIRONMENT

Authorization
None

Enter:

```
db2tx "GET ENVIRONMENT"
```

Here is an example of the output displayed by GET ENVIRONMENT. It shows the current settings of the Text Extender environment variables.

```
Instance name                 (DB2TX_INSTOWNER) = user1
Instance directory      (DB2TX_INSTOWNERHOMEDIR) = /usr/instance1
```

Displaying the text configuration settings

Summary

When When you need the default settings for text, index, and process information.

Command
GET TEXT CONFIGURATION

Authorization
None

These settings are described in "Text configuration settings" on page 233. To change them, see "Changing the text configuration" on page 42.

To display the text configuration, enter:

```
db2tx "GET TEXT CFG"
```

Here is an example of the output displayed by GET TEXT CONFIGURATION. It shows the current text configuration settings.

```
Coded character set ID     (CCSID) = 500
Language                (LANGUAGE) = US_ENGLISH
Format                    (FORMAT) = TDS

Index type              (INDEXTYPE) = LINGUISTIC
```

```
Update frequency      (UPDATEFREQ) = NONE
Index directory        (DIRECTORY) = user1/db2tx/indexes

Update index option  (UPDATEINDEX) = UPDATE
Commit count         (COMMITCOUNT) = 10 000
Tablespace name      (TABLESPACE) = TXLOG
```

Displaying the status of an index

Summary

When When you need to determine whether an index can be searched or updated.

Command
GET INDEX STATUS

Authorization
None

Some situations can occur that prevent you from searching in an index, or from updating it. In such situations, messages are stored in the index's log table that can help you determine the cause. So it can be useful to check the status of an index, and whether there are any messages available.

This example displays the index status for the index of a common-index table:

```
db2tx "GET INDEX STATUS db2tx.sample"
```

The syntax lets you display the index status for a particular text column. This example gets the index status for the index of a multi-index table column:

```
db2tx "GET INDEX STATUS db2tx.sample HANDLE commenthandle"
```

Here is an example of the output displayed by GET INDEX STATUS.

```
Node 0
Search status             = Search available
Update status             = Update available
Reorg status              = started 13.55
Scheduled documents       = 0
Indexed documents         = 187000
Primary index documents   = 130000
Secondary index documents =  57000
Error events              = No error events
```

Search status
Indicates whether you can use the specified handle column to search in the index. If search is not available, check the indicated reason code for more information about why the situation occurred, and then use RESET INDEX STATUS to be able to work with the index again. See "Chapter 16. Error event reason codes" on page 245.

Update status
Indicates whether you can update the index for the specified table or column. If the index update function is not available, check the indicated reason code for more information about why the situation occurred, and then use RESET INDEX STATUS to be able to work with the index again.

Reorg status
Indicates whether you can reorganize the index for the specified table or column. If the reorganize function is not available, check the indicated reason code for more information about why the situation occurred. A common reason for reorganization not being available is because the index is currently being updated.

Scheduled documents
Shows the number of documents that are listed in the queue for indexing (or for deleting from the index).

Indexed documents
Shows the number of documents that have already been indexed from the queue of scheduled documents.

Primary index documents
Shows the number of documents in the primary index.

Secondary index documents
Shows the number of documents in the secondary index.

Error events
Shows the number of events that are available in the index's log table. You can display this information as described in "Displaying error events". When you no longer need this information, you can delete it as described in "Deleting index events" on page 62.

Displaying error events

When problems occur during indexing, such as a document scheduled for indexing could not be found, these so-called *error events* are written to the index's log table.

The event return codes are described in "Chapter 16. Error event reason codes" on page 245.

You can access the error events in a view of the log table called `db2tx.LOGIXnnnnnn`, where *IXnnnnnn* is the name of the index, obtainable from the catalog view.

To get the name of the index:

```
DB2 SELECT TABLENAME,
           HANDLENAME,
           INDEXNAME
    FROM   DB2TX.TEXTCOLUMNS
```

The error event view has the following layout:

```
UPDATESTATUS   SMALLINT
EVENTREASON    INTEGER
EVENTMESSAGE   VARCHAR(1024)
UPDATETIME     TIMESTAMP
HANDLE         DB2TEXTH or DB2TEXTFH
```

Here is an example showing how to access the information from the index log:

```
DB2 SELECT EVENTREASON,
           EVENTMESSAGE,
           UPDATETIME,
           HANDLE
    FROM   DB2TX.LOGIXNNNNNN
```

Displaying the index settings

Summary

When When you need information about the settings of an index.

Command
GET INDEX SETTINGS

Authorization
None

This example gets the index settings for the index of a common-index table:

```
db2tx "GET INDEX SETTINGS db2tx.sample"
```

This example gets the index settings for the index of a multi-index table column:

```
db2tx "GET INDEX SETTINGS db2tx.sample
                HANDLE   commenthandle"
```

If the table is enabled as a multi-index table, this command displays the index settings of all enabled text columns in the table.

Here is an example of the output displayed by GET INDEX SETTINGS for a common-index table. The output for a multi-index table shows similar information for each index. The syntax lets you request the index settings for a particular text column.

```
Current index settings:

     Index type            (INDEXTYPE)   = LINGUISTIC
     Update index option   (UPDATEINDEX) = UPDATE
     Update frequency      (UPDATEFREQ)  = NONE
     Node 0
     Index directory       (DIRECTORY)   = /home/user1/db2tx/indices
```

If the index is split among several nodes, the node information is displayed for the index directory.

Displaying the text settings for a column

Summary

When When you need information about the text settings for a column.

Command
GET TEXT INFO

Authorization
None

This example gets the text information for the index of a common-index table:

```
db2tx "GET TEXT INFO db2tx.sample"
```

This example gets the text information for the index of a multi-index table column:

```
db2tx "GET TEXT INFO db2tx.sample HANDLE commenthandle"
```

The syntax lets you specify a table name and the name of a handle column.

If you specify only a table name in the command, the text information for each enabled column in this table is displayed. If you also specify a handle column name, only the text information for that column is displayed.

Here is an example of what is displayed by this command for a multi-index table:

```
  Text information for column ABSTRACT1
         with handle column ABSTRACT1HANDLE:
  Coded character set ID  (CCSID) = 500
  Language              (LANGUAGE) = US_ENGLISH
  Format                  (FORMAT) = TDS

 Text information for column ABSTRACT2
         with handle column ABSTRACT2HANDLE:
  Coded character set ID  (CCSID) = 500
  Language              (LANGUAGE) = US_ENGLISH
  Format                  (FORMAT) = TDS
```

Working with the Text Extender catalog view

Text Extender creates and maintains a catalog view called DB2TX.TEXTINDEXES for each subsystem. It is created when you run ENABLE SERVER. It contains information about the tables and columns that are enabled for Text Extender.

New entries are created in DB2TX.TEXTINDEXES whenever a table, a column, or external files are enabled. Entries are updated whenever index settings are modified using the CHANGE INDEX SETTINGS command. Entries are deleted if columns or tables are disabled.

Data in the catalog view is available through normal SQL query facilities. However, you cannot modify the catalog view using normal SQL data manipulation commands. You cannot explicitly create or drop the catalog view. Table 4 shows the contents of the catalog view.

Table 4. Text Extender catalog view

Column name	Data type	Null-able	Description
TABLESCHEMA	CHAR(8)	No	Schema of the table to which this entry applies.
TABLENAME	VARCHAR(18)	No	Name of the table to which this entry applies.
COLUMNNAME	VARCHAR(18)	Yes	Name of a column that has been enabled within this table. This value is null if the table has been enabled, but no column has been enabled.
HANDLENAME	VARCHAR(18)	Yes	Name of a handle column. This value is null if there is no column enabled in the table TABLESCHEMA.TABLENAME.
INDEXNAME	CHAR(8)	No	Name of the text index created during enabling of the text table or a text column.
LOGTABLE	VARCHAR(18)	No	Name of the log table for the index INDEXNAME. The table DB2TX.LOGTABLE contains information about which text documents are scheduled for the next update of the text index, and error events.
INDEXTYPE	VARCHAR(30)	No	Type of index: DUAL, LINGUISTIC, PRECISE, NGRAM.
MINIMUM	INTEGER	Yes	The smallest number of index update requests required before an index update is performed. See “Setting the frequency of index updates” on page 240. This value is null if the update frequency is set to NONE.

Table 4. Text Extender catalog view (continued)

Column name	Data type	Null-able	Description
DAYS	VARCHAR(15)	Yes	The days when an update is to be scheduled. See "Setting the frequency of index updates" on page 240. This value is null if the update frequency is set to NONE.
HOURS	VARCHAR(75)	Yes	The hours when an index update is to be scheduled. See "Setting the frequency of index updates" on page 240. This value is null if the update frequency is set to NONE.
MINUTES	VARCHAR(185)	Yes	The minutes when an update is scheduled. See "Setting the frequency of index updates" on page 240. This value is null if the update frequency is set to NONE.
INDEXDIRECTORY	VARCHAR(254)	No	Name of the directory where the text index is stored within the file system.
UPDATEONCREATE	VARCHAR(10)	No	The value "update" or "noupdate", whatever has been specified with the UPDATEINDEX option in ENABLE TEXT TABLE or ENABLE TEXT COLUMN, or in the last CHANGE INDEX SETTINGS.
COMMONINDEX	VARCHAR(4)	No	"yes" if the table TABLESCHEMA.TABLENAME is a common-index table. "no" if the table TABLESCHEMA.TABLENAME is a multi-index table.
CCSID	SMALLINT	Yes	CCSID for the text column TEXTCOLUMN specified with the enable text column command. This value is null if TEXTCOLUMN is null.
LANGUAGE	VARCHAR(30)	Yes	The name of the dictionary used when processing text column TEXTCOLUMN. This value is null if TEXTCOLUMN is null.
FORMAT	VARCHAR(30)	Yes	The format specified for text column TEXTCOLUMN. This value is null if TEXTCOLUMN is null.
FUNCTIONSCHEMA	CHAR(8)	Yes	Schema of the access UDF specified in the ENABLE TEXT COLUMN command using the FUNCTION option. This value is null if no FUNCTION option is specified.
FUNCTIONNAME	VARCHAR(18)	Yes	Name of the access UDF specified in the ENABLE TEXT COLUMN command using the FUNCTION option. This value is null if no FUNCTION option is specified.

Table 4. Text Extender catalog view (continued)

Column name	Data type	Null-able	Description
PROTOTYPEHANDLE	VARCHAR(60)	Yes	A handle for use in performance UDFs. It contains only the index name which is common for the whole text column.
INDEXOPTION	VARCHAR(30)	Yes	Option used when creating the index: CASE_ENABLED.
INDEXPROPERTY	VARCHAR(30)	Yes	Property used when creating the index: SECTIONS_ENABLED
NODENUMBER	INTEGER	No	

Tracing faults

If you need to report an error to an IBM representative, you may be asked to switch on tracing so that information can be written to a file that can be used for locating the error. Use the trace facility only as directed by an IBM Support Center representative, or by your technical support representative.

System performance is affected when tracing is switched on, so use it only when error conditions are occurring.

To turn tracing on, enter:

```
txtrace on options
```

The syntax, and lists of the events and components are given in "TXTRACE" on page 155. Other options are also described there.

You can filter the trace by specifying a "mask" which causes the trace to accept or reject each trace record on the basis of its ID. The default is to trace everything.

A mask has four parts separated by periods, for example: `2.2-6.1,3.*` where:

2 indicates DB2 UDB Text Extender.

2-6 includes only entries with an event ID between 2 and 6.

1,3 includes only those events reported by components 1 and 3.

***** includes all functions of the components.

You can exclude system errors below a certain severity, and you can specify, if the trace buffer becomes full, whether to keep the first or the last records.

To reproduce the error and write the trace information in binary to a dump file, enter:

```
txtrace dump dump-filename
```

After you have written the trace information to a dump file, turn tracing off:

```
txtrace off
```

To produce a formatted version of the dump file, enter:

```
txtrace format dump-filename formatted-filename
```

You can also write the trace information directly from shared memory to a formatted file while tracing is switched on:

```
txtrace format > formatted-file
```

Backing up and restoring indexes and enabled servers

You can backup and restore enabled databases and the text indexes that Text Extender has created.

To **backup**:

1. Find out which tables have been enabled by Text Extender. To do this, enter
   ```
   db2tx "GET STATUS"
   ```
2. Find out the names of the index directories used by the database. To do this, enter
   ```
   db2tx "GET INDEX SETTINGS"
   ```
3. Stop the Text Extender server. To do this enter `TXSTOP`
4. Backup the index directories and their subdirectories `index` and `work`.
5. Backup the file `desmastr.dat` which is located in:
   ```
   instance_owner_home_directory/db2tx/txins000
   ```
6. Restart the Text Extender server:
   ```
   TXSTART
   ```

To **restore**:

1. Stop the Text Extender server:
   ```
   TXSTOP
   ```
2. Save the existing `desmastr.dat` file.
3. Restore the backup copy of the `desmastr.dat` file.
4. Restore the backup copies of the index directories to the same path as before.
5. Restart the Text Extender server:

```
TXSTART
```

Chapter 5. Searching with Text Extender UDFs

Text Extender provides SQL functions that enable you to include text search subqueries in SQL queries. These functions are provided in addition to those normally available in SQL. They are known in DB2 as *user-defined functions* (UDFs).

Refer to "Chapter 9. UDTs and UDFs" on page 161 for a description of the UDFs' syntax.

Before searching, read "Types of index" on page 11, and also use GET INDEX SETTINGS to find out which index type is associated with the text you are searching in. A search can produce different results according to the index type.

The index type assumed in the examples in this chapter is linguistic.

This chapter describes:

- The sample UDFs
- The sample table
- Handles for external files
- Setting the function path to give SQL access to the UDFs
- Searching for text, using CONTAINS, NO_OF_MATCHES, and RANK
- Specifying search arguments in UDFs, using examples of CONTAINS
- Refining a previous search, using CONTAINS and REFINE
- Setting and extracting information in handles, using INIT_TEXT_HANDLE, CCSID, FORMAT, and LANGUAGE
- Improving search performance, using SEARCH_RESULT.

The sample UDFs

Text Extender provides a sample file for UDFs called `txsample.udf`. It contains examples of Text Extender UDFs that run against the sample tables. Use this file to see examples of the syntax of the administration and search UDFs, and of the syntax used in search arguments. You can run the search samples from DB2 SPUFI.

To run this file, enter:

```
db2 -t -v -f txsample.udf
```

The sample table DB2TX.SAMPLE

An extract from the DB2TX.SAMPLE table is shown in Table 5.

Table 5. An extract from the example table DB2TX.SAMPLE

DOCID	AUTHOR	SUBJECT	DATE	COMMENT
doc 5	RSSHERM at CHGVMIC1	LIBDB2E.A error	1995-07-25 -20.13.59	Customer is getting a 'No such file or directory' on LIBDB2E.A. It does not appear to be the same error message that relates to the asynchronous I/O driver. He is using beta 4 on 3.2.5. I have had him compare the permissions and ownership of /usr/lpp/db2_02_01/lib files with mine, and they are now the same. His .profile and ENV also look good. He has, unfortunately, COMMITTED the install. What else could be wrong.
doc 6	EDWARDSC at SYDVM1	Lowercase Userid and Password from DDCS/2	1995-07-25 -20.15.20	After rechecking, the instance where I had problems with case-sensitivity was using a DB2/2 gateway to MVS. It didn't like it when I passed a lower case userid (didn't care about passwd). Connection was only successful if I actually typed an upper case userid. So, I guess this doesn't help your situation. Sorry.
doc 7	SKY at TOROLAB4	ODBC & Stored Procedures	1995-07-25 -20.42.27	There are two sets of sample programs explaining the use of Stored Procedures using CLI (ODBC). The C file inpsrv2.c (placed on the server), and the C file inpcli2.c (placed on the client) make up the sample that demonstrates using stored procedures for input. The files outsrv2.c and outcli2.c make up the sample that demonstrates using stored procedures for output. These files are part of the .../sqllib/samples/cli files. The MAKE file will automatically build them and transfer the server file to the correct subdirectory.

Table 5. An extract from the example table DB2TX.SAMPLE (continued)

DOCID	AUTHOR	SUBJECT	DATE	COMMENT
doc 8	ADAMACHE at TOROLAB2	DB2SYS.DLL access violation	1995-07-25 -21.13.22	Did you have a previous beta version installed? If so, did you remove it using Software Installer? Did you remove the database directories (SQLDBDIR and SQL00001, etc.) from previous beta drivers?
doc 9	ADAMACHE at TOROLAB2	CREATE DB = SYS3175: db2sysc.exe in db2eng.dll	1995-07-25 -21.40.09	Many DB2/2 beta users delete a previous beta with Software Installer, install beta 5 (or golden code now), create a database, and get: SYS3175: db2sysc.exe in db2eng.dll This happens because the directory format has changed between beta4 and beta5. Our DB2/2 installation does not migrate the sqldbdir directory between beta drivers. You should remove all occurrences of sqldbdir and sql000x directories and \sqllib\db2\sqldbdir directory. What you should do is delete the previous beta with Software Installer, remove all occurrences of sqldbdir and sql000x directories and \sqllib\db2\sqldbdir directory, and then install the new code.
doc 10	RSSHERM at CHGVMIC1	DB2/NT - SNA support	1995-07-25 -22.10.15	Will DB2/NT be able to act as both a server to CAE/WIN clients and also as a client (hopping) to DB2/6000 and/or DB2/MVS over an SNA network? The other alternative would be DRDA from DB2/NT to DB2/6000 and/or DB2/MVS - again via SNA, which I assume is supported?

Here is a part of the table structure showing the first and last columns:

DB2TX.SAMPLE

DOCID	COMMENT
doc 1	Customer is ...
doc 2	After rechecking ...

Figure 11. The structure of the DB2TX.SAMPLE table

The column containing text to be searched is COMMENT. Before you can search through the text in this column, however, you must prepare the COMMENT column for use by Text Extender using the ENABLE TEXT COLUMN command. This is described in "Preparing text documents for searching" on page 41.

After this preparation step, the DB2TX.SAMPLE table looks like this:

DB2TX.SAMPLE

DOCID	COMMENT	COMMENTHANDLE
doc 1	Customer is ...	X'..handle..'
doc 2	After rechecking ...	X'..handle..'

Figure 12. The DB2TX.SAMPLE table after being enabled

The table now has an additional column for handles, and each text object has a unique handle that represents it.

When you later insert text into an enabled text column, an insert trigger creates a handle for it.

DB2TX.SAMPLE

DOCID	COMMENT	COMMENTHANDLE	
doc 1	Customer is ...	X'..handle..'	Handles created by ENABLE TEXT COLUMN
doc 2	After rechecking ...	X'..handle..'	

Inserted row:

doc 11	I have installed ...	X'..handle..'	Handle created by an insert trigger

Figure 13. The handle for an inserted row is created by a trigger

A handle contains the following information:

A document ID

The name and location of the associated index

The document information: CCSID, format, and language.

The UDFs provided by Text Extender take a handle as a parameter and store, access, search for, and manipulate the text as part of the SQL processing of the table.

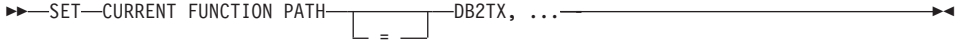
Handles for external files

Text Extender can search not only in text stored in DB2 UDB for OS/390 tables, but also in text files stored elsewhere. “Enabling external text files” on page 55 describes the preparation step that makes it possible to search in text documents that are not stored in DB2 UDB for OS/390 tables. In this step, the ENABLE TEXT FILES command creates a handle column of type DB2TEXTFH for external-file handles. The handle column is added to an existing table.

You could, for example, create a table that contains columns for the name of the author and for the date when the document was created.

You initialize the files' handles using INIT_TEXT_HANDLE. Each handle contains not only a document ID, the name and location of the associated index, and the document information (CCSID, format, and language), but also the reference to the external file.

Setting the current function path



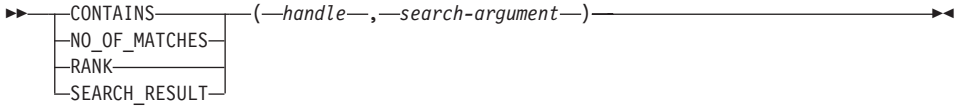
Use the SQL statement SET CURRENT FUNCTION PATH to add DB2TX to your current path names so that SQL can find the Text Extender UDFs. If you decide not to do this, you can qualify the UDF names explicitly by typing, for example, DB2TX.CONTAINS for the CONTAINS UDF.

The examples in this chapter use the qualified form for Text Extender functions. You can use the example statements exactly as they are written without having to set the current function path.

Tip

Remember to set the current function path each time you connect to a database.

Searching for text



This section describes how to use the UDFs provided with Text Extender to search in DB2 databases containing text. It tells you how to:

- Make a query
- Determine how many matches were found in a text document
- Get the rank of a found text document.

The use of SEARCH_RESULT is described in "Improving search performance" on page 94.

Each of these UDFs searches in the text index for occurrences of the search argument. If there are, say, 100 000 text documents in the table, the CONTAINS, RANK, or NO_OF_MATCHES UDF is called 100 000 times. But the text index is not searched 100 000 times. Instead, the first time the UDF is called, an internal list of all the documents containing the search term is created; subsequent calls of the UDF determine if the document concerned is in the list.

Tip

When you use the Text Extender UDFs to search in a table, be sure to pass the handle column to the UDF, rather than the text column. If you try to search in a text column, SQL responds with a message indicating that the data type is wrong, for example:

```
No function by the name "CONTAINS" having compatible
arguments was found in the function path.
```

If you search for text immediately after issuing the ENABLE TEXT TABLE or ENABLE TEXT COLUMN command, an error RC_SE_EMPTY_INDEX can occur which indicates that the index being created by the command does not yet exist. The time taken for an index to be created depends on factors such as

the number of documents being indexed, and the performance of the system doing the indexing. It can vary from several minutes to several hours, and should be done when the system is lightly loaded, such as over night.

If this message occurs, try searching again later, or use GET INDEX STATUS to check whether indexing errors have occurred.

Making a query

This example demonstrates how the CONTAINS function searches for text in documents identified by a handle. It returns 1 if the text satisfies the search argument, otherwise it returns 0.

```
SELECT DATE, SUBJECT
   FROM DB2TX.SAMPLE
   WHERE DB2TX.CONTAINS (COMMENTHANDLE, '"compress"') = 1
```

In this example, you search for the term `compress` in the text referred to by the handles in the column COMMENTHANDLE. The handles in the COMMENTHANDLE column indicate where the COMMENT text is indexed.

Tip

If you have created mixed-case identifiers for tables or columns, remember that these names must be enclosed in double quotes. For example:

```
SELECT DATE, SUBJECT
FROM "DB2TX.Sample"
WHERE DB2TX.CONTAINS (COMMENTHANDLE, '"compress"') = 1
```

If you specify DB2 UDB for OS/390 `select` statements from the command line, the operating system command-line parser removes special characters such as double quotes from the command string, so you must use a backslash to mask these special symbols. For example:

```
DB2 "SELECT DB2TX.file(COMMENTHANDLE)
    FROM DB2TX.Sample"
    WHERE DB2TX.CONTAINS (COMMENTHANDLE, '\"compress\"') = 1
```

Searching and returning the number of matches found

Use the NO_OF_MATCHES function to determine how often the search criteria are found in each text document.

```
WITH TEMPTABLE(DATE, SUBJECT, MATCHES)
    AS (SELECT DATE, SUBJECT,
               DB2TX.NO_OF_MATCHES(COMMENTHANDLE,'"compress"')
        FROM DB2TX.SAMPLE)
    SELECT *
        FROM TEMPTABLE
        WHERE MATCHES > 0
```

NO_OF_MATCHES returns an integer value.

Searching and returning the rank of a found text document

RANK is an absolute value that indicates how well the document met the search criteria relative to other found documents. The value indicates the number of matches found in the document in relation to the document's size. You can get the rank of a found document by using the RANK UDF.

Here is an example:

```
WITH TEMPTABLE(DATE, SUBJECT, RANK)
    AS (SELECT DATE, SUBJECT,
               DB2TX.RANK(COMMENTHANDLE,'"compress"')
        FROM DB2TX.SAMPLE)
    SELECT *
        FROM TEMPTABLE
        WHERE RANK > 0
        ORDER BY RANK DESC
```

RANK returns a DOUBLE value between 0 and 1.

Specifying search arguments

Search arguments are used in CONTAINS, NO_OF_MATCHES, RANK, and HANDLE_LIST. This section uses the CONTAINS function to show different examples of search arguments in UDFs.

Searching for several terms

You can have more than one term in a search argument. One way to combine several search terms is to connect them together using commas, like this:

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE,
    '("compress", "compiler", "pack", "zip", "compact")') = 1
```

This form of search argument finds text that contains any of the search terms. In logical terms, the search terms are connected by an OR operator.

Searching with the Boolean operators AND and OR

(See also "Searching with the Boolean operator NOT" on page 88.)

Search terms can be combined with other search terms using the Boolean operators "&" (AND) and "|" (OR). For example:

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE,
                        '"compress" | "compiler"') = 1
```

You can combine several terms using Boolean operators:

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE,
                        '"compress" | "compiler" & "DB2"') = 1
```

If you use more than one Boolean operator, Text Extender evaluates them from left to right, but the logical AND operator (&) binds stronger than the logical OR operator (|). For example, if you do not include parentheses,

```
"DB2" & "compiler" | "support" & "compress"
```

is evaluated as:

```
("DB2" & "compiler") | ("support" & "compress")
```

So in the following example you must include the parentheses:

```
"DB2" & ("compiler" | "support") & "compress"
```

If you combine Boolean operators with search terms chained together using the comma separator, like this:

```
("compress", "compiler") & "DB2"
```

the comma is interpreted as a Boolean OR operator, like this:

```
("compress" | "compiler") & "DB2"
```

Searching for variations of a term

If you are using a **precise** index, Text Extender searches for the terms exactly as you type them. For example, the term `media` finds only text that contains "media". Text that contains the singular "medium" is not found.

If you are using a **linguistic** index, Text Extender searches also for variations of the terms, such as the plural of a noun, or a different tense of a verb.

For example, the term `drive` finds text that contains "drive", "drives", "driving", "drove", and "driven.".

If you are using a **dual** index, you can choose to search for word variations or not. For example, the following query finds only occurrences of "utility":

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE, 'PRECISE FORM OF "utility"') = 1
```

By contrast, this example finds occurrences of “utility” and “utilities”:

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE, 'STEMMED FORM OF "utility"') = 1
```

Searching for parts of a term (character masking)

Masking characters, otherwise known as “wildcard” characters, offer a way to make a search more flexible. They represent optional characters at the front, middle, or end of a search term. They increase the number of text documents found by a search.

Tip

If you use masking characters, you cannot use the SYNONYM FORM OF keyword. If you use a dual index type, the masked search is case-sensitive.

Masking characters are particularly useful for finding variations of terms if you have a precise index. If you have a linguistic index, many of the variations found by using masking characters would be found anyway.

Note that word fragments (words masked by wildcard characters) cannot be reduced to a base form. So, if you search for `passe%`, you will not find the words “passes” or “passed”, because they are reduced to their base form “pass” in the index. To find them, you must search for `pass%`.

Text Extender uses two masking characters: underscore (_) and percent (%):

- % represents **any number of arbitrary characters**. Here is an example of % used as a masking character at the front of a search term:

  ```
  SELECT DATE, SUBJECT
    FROM DB2TX.SAMPLE
    WHERE DB2TX.CONTAINS (COMMENTHANDLE, '"%name"') = 1
  ```

  This search term finds text documents containing, for example, “username”, “filename”, and “table-name”.

  % can also represent a **whole word**: The following example finds text documents containing phrases such as “graphic function” and “query function”.

  ```
  SELECT DATE, SUBJECT
    FROM DB2TX.SAMPLE
    WHERE DB2TX.CONTAINS (COMMENTHANDLE, '"% function"') = 1
  ```

- _ represents **one character** in a search term: The following example finds text documents containing “CLOB” and “BLOB”.

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE, '"_LOB"') = 1
```

Searching for terms that already contain a masking character

If you want to search for a term that contains the "%" character or the "_" character, you must precede the character by a so-called *escape* character, and then identify the escape character using the ESCAPE keyword.

For example, to search for "10% interest":

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE,
                        '"10!% interest" ESCAPE "!"') = 1
```

The escape character in this example is "!".

Searching for terms in any sequence

If you search for "hard disk" as shown in the following example, you find the two terms only if they are adjacent and occur in the sequence shown, regardless of the index type you are using.

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE, '"hard disk"') = 1
```

To search for terms in any sequence, as in "data disks and hard drives", for example, use a comma to separate the terms:

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE, '("hard", "disk")') = 1
```

Searching for terms in the same sentence or paragraph

Here is an example of a search argument that finds text documents in which the search terms occur in the same sentence:

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE,
                  '"compress" IN SAME SENTENCE AS "decompress"') = 1
```

You can also search for more than two words occurring together. In the next example, a search is made for several words occurring in the same paragraph:

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE,
                        '"compress" IN SAME PARAGRAPH AS "decompress"
                                              AND "encryption"') = 1
```

Searching for terms in sections of structured documents

Here is an example of a search argument that finds text documents in which the search term `Williams` occurs in the subsection `author` in section `play` of structured documents. The document structure is specified by model `play` which is described in a document model file. See "Working with structured documents" on page 54 for more information.

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE,
                  'MODEL play SECTIONS (play/author) "williams"') = 1
```

Searching for synonyms of terms

For a linguistic or a dual index, you can make your searches more flexible by looking not only for the search terms you specify, but also for words having a similar meaning. For example, when you search for the word "book", it can be useful to search also for its synonyms. To do this, specify:

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE, 'SYNONYM FORM OF "book"') = 1
```

When you use SYNONYM FORM OF, it is assumed that the synonyms of the term are connected by a logical OR operator, that is, the search argument is interpreted as:

```
"book" | "article" | "volume" | "manual"
```

The synonyms are in a dictionary that is provided with Text Extender. The default dictionary used for synonyms is always US_ENGLISH, not the language specified in the text configuration settings.

You can change the dictionary for a particular query by specifying a different language. Here is an example:

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE,
                        'SYNONYM FORM OF UK_ENGLISH "programme"') = 1
```

Tip
You cannot use the SYNONYM keyword if there are masking characters in a search term, or if NOT is used with the search argument.

Making a linguistic search

Text Extender offers powerful linguistic processing for making a search based on the search terms that you provide. The linguistic functions are applied when the index is linguistic or when a dual index is used with STEMMED FORM OF parameter. The linguistic functions are described in "Chapter 3. Linguistic processing" on page 17.

An example of this is searching for a plural form, such as "utilities", and finding "utility". The plural is reduced to its base form `utility`, using an English dictionary, before the search begins.

The English dictionary, however, does not have the information for reducing variations of terms in other languages to their base form. To search for the plural of a term in a different language you must use the dictionary for that language.

If you specify GERMAN, for example, you can search for "geflogen" (flown) and find all variations of its base form "fliegen" (fly)—not only "geflogen", but also "fliege", "fliegt", and so on.

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE,
                        'STEMMED FORM OF GERMAN "geflogen"') = 1
```

Tip
When searching in documents that are not in U.S. English, specify the language in the search argument *regardless of the default language*.

If you always specify the base form of a search term, rather than a variation of it, you do not need to specify a language.

To understand why, consider what happens when the text in your database is indexed. If you are using a linguistic or a dual index, all variations of a term are reduced to their base form before the terms are stored in the index. This means that, in the DB2TX.SAMPLE table, although the term "decompress" occurs in the first entry in the COMMENT column, "decompression" occurs in

the second entry, the index contains only the base form “decompress” and identifies this term (or its variations) as being in both entries.

Later, if you search for the base form “decompress”, you find all the variations. If, however, you search for a variation like “decompression”, you cannot find it directly. You must specify an appropriate dictionary for the search, so that the variation can first be converted to its base form.

Searching with the Boolean operator NOT

You can use the Boolean operator NOT to exclude particular text documents from the search. For example:

```
("compress", "compiler") & NOT "DB2"
```

Any text documents containing the term “DB2” are excluded from the search for “compress” or “compiler”.

You cannot use the NOT operator in combination with IN SAME SENTENCE AS or IN SAME PARAGRAPH AS described in “Searching for terms in the same sentence or paragraph” on page 85, neither can you use it with SYNONYM FORM OF described in “Searching for synonyms of terms” on page 86.

You can use the NOT operator only with a search-primary, that is, you cannot freely combine the &, |, and NOT operators (see “Search argument syntax” on page 174).

Example of the use of NOT that is **not** allowed:

```
NOT("compress" & "compiler")
```

Allowed is:

```
NOT("compress" , "compiler")
```

Fuzzy search

“Fuzzy” search searches for words that are spelled in a similar way to the search term. It is available for Ngram indexes.

For example:

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE,
                        'FUZZY FORM OF 2 "compress"') = 1
```

This search could find an occurrence of the misspelled word `conpress`.

The match level, in the example "2", specifies the degree of accuracy. Five levels are supported, where level 1 gives the loosest matching of about 20 percent, and level 5 gives the tightest matching of about 90 percent. Use a fuzzy search when the misspellings are possible in the document, as is often the case when the document was created using an Optical Character Recognition device, or phonetic input.

Respecting word-phrase boundaries

"Bound" search has been developed for the Korean language. It ensures that Text Extender respects word boundaries during the search. For example:

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE,
                        'BOUND "korean-expression"') = 1
```

Searching for similar-sounding words

"Sound" search finds words that sound like the search argument. This is useful when documents can contain words that sound alike, but are spelled differently. The German name that is pronounced my-er, for example, has several spellings.

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE,
                        'SOUNDS LIKE "Meyer"') = 1
```

This search could find occurrences of "Meyer", "Mayer", and "Maier".

Thesaurus search

Thesaurus search is another of Text Extender's powerful search-term expansion functions. The additional terms searched for are taken from a thesaurus that you build yourself, so you have direct control over them. You search for "database", for example, and could find terms like "repository" and "DB2".

This type of search is intended for specific areas of interest in which you make frequent searches; an area in which it is worth the investment in time to build a thesaurus in order to produce significantly more effective search results.

See "Thesaurus concepts" on page 27 for more information and a description of how to build a thesaurus. The example in Figure 4 on page 28 is a small extract from a thesaurus on the subject of databases. It is used in the following examples that demonstrate the syntax for using thesaurus expansion.

This example takes the term “object relational database management system” and expands it, adding all *instances* of this term found in the thesaurus “myterms”. Here, “DB2” is added to the search.

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE,
              'THESAURUS "myterms"
              EXPAND "INST"
              TERM OF "object relational database management system"
              ') = 1
```

The next example takes the term “document management system” and expands it, adding all its *synonyms*. There is one synonym – “library”.

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE,
              'THESAURUS "myterms"
              EXPAND "SYN"
              TERM OF "document management system"
              ') = 1
```

Free-text and hybrid search

“Free-text search” is a search in which the search term is expressed as free-form text. A phrase or a sentence describes in natural language the subject to be searched for. The sequence of words in a free-text query are not relevant. Furthermore, so-called *lexical affinities* are supported. In retrieval, these are certain pairs of words occurring in a free-text query term, and occurring in the document collection, with a certain minimal frequency and a certain minimal distance. The distance for English documents is five words.

Note that the masking of characters or words is not supported for search strings in a free-text argument.

For example:

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE,
        'IS ABOUT "everything related to AIX installation"') = 1
```

Hybrid search is a combination of Boolean search and free-text search. For example:

```
SELECT DATE, SUBJECT
  FROM DB2TX.SAMPLE
  WHERE DB2TX.CONTAINS (COMMENTHANDLE,
        '"DB2" & IS ABOUT "everything related to AIX installation"') = 1
```

Refining a previous search

When a search argument finds too many occurrences, it can often be useful to narrow, or *refine*, the search by combining the initial search argument with a second search argument in a Boolean-AND relationship.

You can refine search results without using the REFINE function, by storing the results in a table and making the next search against this table. However, depending on the number of qualifying terms, this method is less efficient than that of storing the latest search argument and using REFINE.

The following steps show how to make a search, and then refine it using the REFINE function. The REFINE function returns a search argument that is a Boolean-AND combination of its two input parameters. The combined search argument returned by REFINE is a value of type LONG VARCHAR.

1. Create a table for old search arguments.

   Create a table PREVIOUS_SEARCHES to hold the search arguments of searches that have already been made.

   ```
   CREATE TABLE PREVIOUS_SEARCHES (step INT,
                                   searchargument LONG VARCHAR)
   ```

PREVIOUS_SEARCHES

STEP	SEARCHARGUMENT

2. Search for the first search argument.

   Search for the word “compress” in the sample table.

   ```
   SELECT COMMENT
     FROM DB2TX.SAMPLE
     WHERE DB2TX.CONTAINS (COMMENTHANDLE, '"compress"') = 1
   ```

   Insert the search argument into the PREVIOUS_SEARCHES table for use by further steps.

   ```
   INSERT INTO PREVIOUS_SEARCHES
     VALUES (1, '"compress"')
   ```

PREVIOUS_SEARCHES

STEP	SEARCHARGUMENT
1	"compress"

3. Refine the search.

Refining a previous search

Assuming that the search returns too many text documents, refine the search by combining the previous search term with the word “compiler” using the REFINE function.

```
WITH LAST_STEP(STEP_MAX)
     AS (SELECT MAX(STEP)
         FROM PREVIOUS_SEARCHES),
     LAST_SEARCH(LAST_SEARCH)
     AS (SELECT SEARCHARGUMENT
         FROM PREVIOUS_SEARCHES,LAST_STEP
         WHERE STEP = STEP_MAX)
SELECT COMMENT
     FROM DB2TX.SAMPLE, LAST_SEARCH
     WHERE DB2TX.CONTAINS(COMMENTHANDLE,
                 DB2TX.REFINE(LAST_SEARCH, '"compiler"')) = 1
```

Insert the refined search argument into the PREVIOUS_SEARCHES table for use by further steps.

```
INSERT INTO PREVIOUS_SEARCHES
  WITH LAST_STEP(STEP_MAX)
       AS (SELECT MAX(STEP)
           FROM PREVIOUS_SEARCHES)
  SELECT STEP_MAX+1, DB2TX.REFINE(SEARCHARGUMENT, '"compiler"')
    FROM PREVIOUS_SEARCHES, LAST_STEP
```

PREVIOUS_SEARCHES

STEP	SEARCHARGUMENT
1	"compress"
2	"compress" & "compiler"

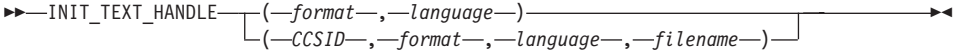
You can repeat this step until the number of text documents found is small enough.

Setting and extracting information in handles

Handles contain the CCSID, format, and language of their text documents. Handles for external files contain additionally a pointer to the external file. These handles are created when you enable a text column or external files.

The UDFs described here let you set or change the text information in the handles.

Setting text information when inserting new text



When you run the ENABLE TEXT COLUMN command to enable a text column that already contains text, you can implicitly set the format and language of the text to the values specified in the text configuration settings. These format and language settings are then stored in the handle. If you want different format and language values, you can specify them explicitly in the ENABLE TEXT COLUMN command.

When you run the ENABLE TEXT FILES command, you can also set the document's CCSID and location.

When you later insert a row containing text, an insert trigger creates a handle and sets the text format and language to the values that were used when the text column was enabled.

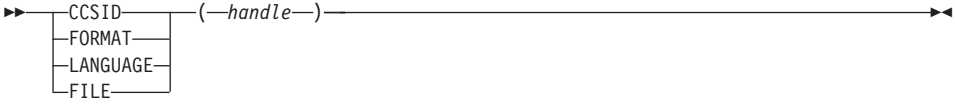
To set the format and language to values that are different from these values, use the INIT_TEXT_HANDLE function in the INSERT command. While the row is being inserted, the INIT_TEXT_HANDLE function creates a partially initialized handle that contains the language and format values you specify. The insert trigger then fills in the other values in the handle.

In the following example, INIT_TEXT_HANDLE presets the language and format in an initialized handle. The INSERT command places this handle in the COMMENTHANDLE column.

```
INSERT INTO DB2TX.SAMPLE (DOCID, COMMENT, COMMENTHANDLE)
       VALUES ('doc 101',
               'I have installed...',
               DB2TX.INIT_TEXT_HANDLE('AMI', 'GERMAN') )
```

The value returned by INIT_TEXT_HANDLE is type DB2TEXTH, or DB2TEXTFH.

Extracting information from handles



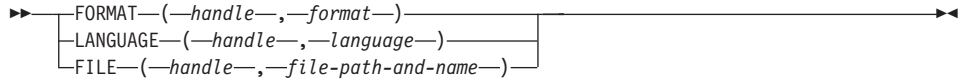
Here is an example of extracting a CCSID from a handle:

```
SELECT DISTINCT DB2TX.CCSID(COMMENTHANDLE)
       FROM DB2TX.SAMPLE
```

In the same way, you can extract the format or the language of a text document, or the location of external files. Here is an example that illustrates the use of the FORMAT function. It returns the number of ASCII (TDS) documents in the sample table.

```
SELECT COUNT(*)
       FROM DB2TX.SAMPLE
       WHERE DB2TX.FORMAT(COMMENTHANDLE) = 'TDS'
```

Changing information in handles



The FORMAT and LANGUAGE functions can also change the corresponding specification in a handle. These functions return the changed handle as a value of type DB2TEXTH, or DB2TEXTFH.

The following example shows how to change the language setting of a text document.

```
UPDATE DB2TX.SAMPLE
       SET COMMENTHANDLE = DB2TX.LANGUAGE(COMMENTHANDLE, 'FRENCH')
       WHERE ...
```

Using the LANGUAGE UDF again, you can see that the change has occurred:

```
SELECT DISTINCT DB2TX.LANGUAGE(COMMENTHANDLE)
       FROM DB2TX.SAMPLE
```

Improving search performance

The SEARCH_RESULT UDF exploits the DB2 concept of table-valued functions. The UDF is used in the FROM clause of an SQL statement, and returns an intermediate table with the search result of the specified search string. The syntax of the search string is the same as described in “Chapter 10. Syntax of search arguments” on page 173. The advantage of this UDF compared with CONTAINS or RANK is a significant performance improvement when large tables are involved.

The returned table has the following structure:

```
Column Name         Datatype
HANDLE              DB2TX.DB2TEXTH, DB2TX.DB2TEXTFH
NUMBER_OF_MATCHES   INTEGER
RANK                DOUBLE
```

Example:

```
SET CURRENT FUNCTION PATH = db2tx
WITH REPHANDLE (MYDOCHANDLE) AS
  ( SELECT DB2TX.DB2TEXTH(PROTOTYPEHANDLE)
    FROM db2tx.textcolumns
    WHERE TABLESCHEMA = 'DB2TX'   AND
          TABLENAME   = 'SAMPLE'  AND
          COLUMNNAME  = 'COMMENT' AND
          HANDLENAME  = 'COMMENTHANDLE'
  )
SELECT NUMBER_OF_MATCHES,RANK,HANDLE
   FROM REPHANDLE,
   TABLE(DB2TX.SEARCH_RESULT(MYDOCHANDLE,'"compress"')) T1
```

SELECT NUMBER_OF_MATCHES,RANK,HANDLE causes all three items to be returned, but you can specify them in any combination. You may wish, for example to omit RANK to avoid the intensive processing associated with it.

If you need only the HANDLE value, you can simply use SELECT COUNT(*).

Chapter 6. Using the API functions for searching and browsing

This chapter describes how to use the search and browse functions of the Text Extender API. For a detailed description of these functions, refer to "Chapter 11. API functions for searching and browsing" on page 185. Examples of programs that use the API functions are given in "Chapter 15. Sample API program" on page 243. The same chapter describes a sample browse function DesBrowseDocument.

Tip

Before searching, you should read "Types of index" on page 11. A search can produce different results depending on which index type is used. Use GET INDEX SETTINGS to find out which text index type is associated with the text you are searching in.

You should also read "The sample table DB2TX.SAMPLE" on page 76.

Setting up your application

An application program that uses the Text Extender API is a DB2 CLI application, because some of the API functions require a database connection handle as input. This means that the rules that have to be considered for DB2 CLI applications apply also to applications that use the Text Extender API.

In your application, include `des_ext.h` which is provided in the `include` subdirectory of the Text Extender installation directory.

To use your application program with the Text Extender API, link your program to the API.

Linking an application

You must link the library `libdescl.a` to your application. This library is in the `lib` subdirectory of the Text Extender installation directory.

Overview of the API functions

These are the search and browse functions; the first is a search function, the remainder are browse functions:

DesGetSearchResultTable

DesGetBrowseInfo

DesStartBrowseSession

DesOpenDocument

DesGetMatches

DesCloseDocument

DesEndBrowseSession

DesFreeBrowseInfo.

Tip

Many of the API functions need a connection handle (hdbc). You must provide this handle using the SQLConnect function, but this does not prevent you from calling Text Extender from embedded SQL programs. The *DB2 Call Level Interface Guide and Reference* describes how to mix CLI statements with embedded SQL statements.

You can use the search and browse functions for:

Searching for text

Browsing text.

Searching for text

In this scenario, only the search function DesGetSearchResultTable is needed. It takes as input a search argument and a handle column name. It searches for text and puts information about the documents found into a result table that you have prepared previously.

This function is described in more detail in “Searching for text” on page 99. See also “Chapter 15. Sample API program” on page 243.

Browsing text

Use the following functions in the sequence shown:

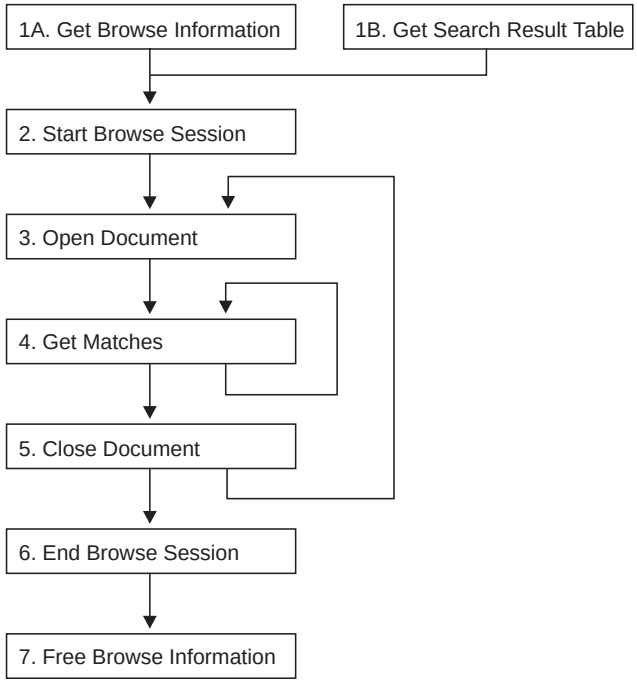


Figure 14. Sequence for using the API functions

These functions get highlighting information, then start a browse session to display a text document and highlight the found terms.

In a browse session, you can open and display further documents using the same highlighting information. These functions are described in more detail in "Browsing text" on page 100.

Searching for text

There is one API function for searching for text: the DesGetSearchResultTable function.

Get a search result table (DesGetSearchResultTable)

The DesGetSearchResultTable function receives a search argument for searching through text documents in a particular text column, and stores the result in a table. The result table contains the handle of each document found. It can also contain rank information and the number of matches, depending on the search option specified.

You can also obtain this information using the RANK and NO_OF_MATCHES UDFs. Here is an example:

```
INSERT INTO RESULT
       SELECT COMMENTHANDLE,
              RANK(COMMENTHANDLE, '"stored procedures"'),
              NO_OF_MATCHES(COMMENTHANDLE, '"stored procedures"')
       FROM DB2TX.SAMPLE
       WHERE  CONTAINS(COMMENTHANDLE, '"stored procedures"') = 1
```

DesGetSearchResultTable can be used only on base tables, but it can be faster than using UDFs if the query is a text-only query; it goes directly to the Text Extender server to get the rank and the number of matches, and it loops only for the number of matching documents found. In the UDF example, on the other hand, the CONTAINS function is called once for each row in the table; then, for each qualifying row, the RANK and NO_OF_MATCHES functions are called. For each found document, three separate searches are made.

Input

The input parameters are:

- The handle for the database connection
- The table to be searched
- The name of the handle column that is associated with the text column to be searched
- A search argument
- Search options
- A browse option (to return browse information)
- The name of the table where the result is to be stored.

Output

If a browse option is specified, this function returns a pointer to browse information.

Browsing text

This group of functions in Figure 14 on page 99 finds out which terms are to be highlighted. It then starts a browse session, opens a document, and gets match information in the form of a data stream that can be parsed by an application program that calls your browser.

Get browse information (DesGetBrowseInfo)

The DesGetBrowseInfo function receives a search argument and a handle. It returns a pointer to the browse information needed by DesStartBrowseSession. Browse information includes a list of all the terms to be highlighted.

Another method of getting browse information is to specify the Browse option in the function DesGetSearchResultTable.

Input

The input parameters are:

The handle for database connection

A handle

A search argument.

Output

This function returns a pointer to browse information.

Start a browse session (DesStartBrowseSession)

The DesStartBrowseSession function starts a browse session, establishing the environment needed for browsing a text document and highlighting its matches. It receives a pointer to browse information, either from DesGetBrowseInfo or from DesGetSearchResultTable, and returns a browse session handle for use by the other browse functions.

Input

The input parameter is:

A pointer to browse information from DesGetBrowseInfo or DesGetSearchResultTable

A user ID

A password.

Output

This function returns a browse session handle.

Open a document (DesOpenDocument)

The DesOpenDocument function receives a browse session pointer, a handle, and an option DES_FAST or DES_EXTENDED indicating the type of linguistic processing to be used for highlighting found terms. See “Stage 2: Extended

matching" on page 24. DES_FAST uses basic text analysis, without the use of a dictionary, to determine which terms are to be highlighted. DES_EXTENDED uses extended matching.

DesOpenDocument prepares the text document that corresponds to the handle to get the document text and highlighting information, and it returns a document handle that is used for iteratively calling DesGetMatches.

Input

The input parameters are:

A browse session handle from DesStartBrowseSession

A text handle

A match option: DES_FAST or DES_EXTENDED.

Output

This function returns a document handle which is used by DesGetMatches and DesCloseDocument.

Get matches (DesGetMatches)

The DesGetMatches function returns a pointer to highlighting information for the text document described by a document handle. The highlighting information is a data stream. It comprises the text context (at least one paragraph) and information for highlighting text in that context. The data stream is described in "Data stream syntax" on page 194. An application program can parse the data stream and process it using the user's own browser.

DesGetMatches returns only a portion of the data stream, indicating the length of the portion in the output structure.

A sequence of calls to DesGetMatches gets the entire text document content. When the end of the text document is reached, an indicator is returned.

Input

The input parameters are:

A browse session handle

A document handle from DesOpenDocument.

Output

This function returns a pointer to a structure containing the data stream portion and its length.

Close a document (DesCloseDocument)

The DesCloseDocument function closes a text document opened by DesOpenDocument, and releases the storage allocated during the return of document text and highlighting information.

Input

The input parameters are:

A browse session handle

A document handle from DesOpenDocument.

Output

None.

End a browse session (DesEndBrowseSession)

The DesEndBrowseSession function ends a browse session started by DesStartBrowseSession, and releases the storage allocated for the browse session.

Input

The input parameter is:

A browse session handle

Output

None.

Free the browse information (DesFreeBrowseInfo)

The DesFreeBrowseInfo function frees storage allocated for the browse information by DesGetBrowseInfo.

Input

The input parameter is:

A pointer to the browse information.

Output

None.

Part 2. Reference

Chapter 7. Administration commands for the client

Command	Purpose	Page
?	Command line processor help	108
CHANGE INDEX SETTINGS	Changes the characteristics of an index	109
CHANGE TEXT CONFIGURATION	Changes the text configuration settings	111
CONNECT	Connects you to a subsystem	114
DELETE INDEX EVENTS	Deletes index events from a log table	115
DISABLE SERVER	Disables a server from use by Text Extender	116
DISABLE TEXT COLUMN	Disables a text column from use by Text Extender, and deletes its associated index	117
DISABLE TEXT FILES	Disables text files from use by Text Extender, and deletes their associated index	118
DISABLE TEXT TABLE	Disables a table from use by Text Extender and deletes the indexes associated with the table	119
ENABLE SERVER	Prepares a server for use by Text Extender	120
ENABLE TEXT COLUMN	Prepares a text column for use by Text Extender and creates an individual text index for the column	122
ENABLE TEXT FILES	Prepares text files for use by Text Extender and creates an individual text index for the files	129
ENABLE TEXT TABLE	Creates a common text index for a table	132
GET ENVIRONMENT	Displays the current settings of the environment variables	136
GET INDEX SETTINGS	Displays the characteristics of an index	137
GET INDEX STATUS	Displays status information for an index	139
GET STATUS	Displays the enabled status of databases, tables, and columns	140
GET TEXT CONFIGURATION	Displays the text configuration settings	141
GET TEXT INFO	Displays the text information for a text column	142
QUIT	Exits from the administration command line processor mode	143
REORGANIZE INDEX	Reorganizes an index to improve search efficiency	144
RESET INDEX STATUS	Resets the status of an index to allow it to be used again	145
UPDATE INDEX	Updates a text index	146

This chapter describes the syntax of the administration commands for the client. Client administration consists of tasks you must do before you can begin searching in text documents, and maintenance tasks. “Chapter 4. Administration” on page 37 describes how to use these commands.

Before you use these commands, start the Text Extender command line processor by entering the command `db2tx`. It puts you into an interactive input mode in which all subsequent commands are interpreted as Text Extender commands. Normally, you would start the command processor at the same time as you start DB2.

To leave this mode, enter QUIT.

Tip

A command prefixed with `db2tx` causes a connection to be made to the default subsystem specified in the environment variable DB2DBDFT. The following sequence of commands does not enable the database MYDATABASE, but instead enable the default database.

```
db2tx "CONNECT TO MYDATABASE"
db2tx "ENABLE DATABASE"
```

Command line processor help

To display a list of administration commands, enter:

```
db2tx "?"
```

To display the syntax of an individual command, enter:

`db2tx "? `*command*`"`

For example:

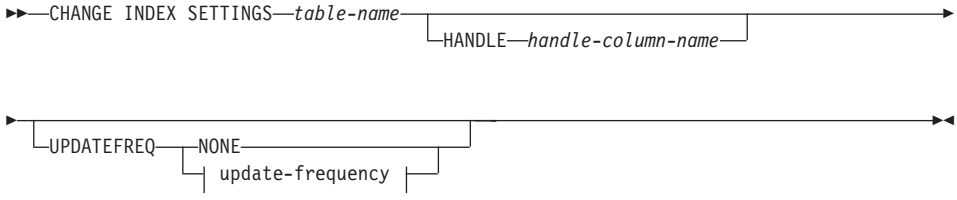
```
db2tx "? CHANGE INDEX SETTINGS"
```

CHANGE INDEX SETTINGS

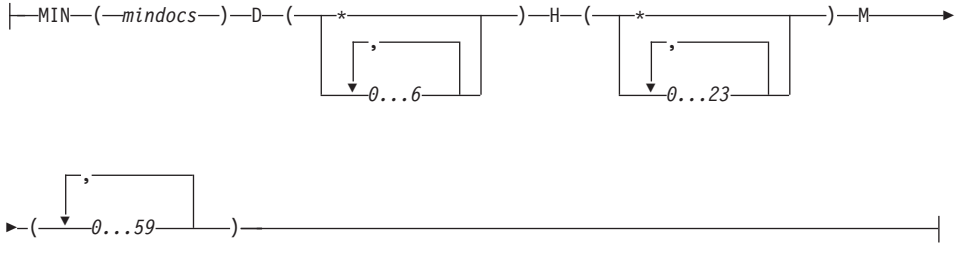
This command changes the characteristics of an index **after** the database has been enabled.

To changes the default settings that are used when a database is first enabled, use "CHANGE TEXT CONFIGURATION" on page 111.

Command syntax



update-frequency:



Command parameters

table-name
The name of the text table in the connected database that contains the text column whose index update frequency is to be changed. The name must include an explicit schema name (qualifier) unless the schema name is the same as your user ID.

HANDLE handle-column-name
The name of the handle column whose index update frequency is to be changed. This is required if the text column has its own index, that is, if the index was created using the command ENABLE TEXT COLUMN.

If, however, the index was created using the command ENABLE TEXT TABLE, that is, the table has one text index for all text columns, then this keyword is ignored.

UPDATEFREQ update-frequency

The index update frequency in terms of when the update is to be made, and the minimum number of text documents that must be queued in the log table. If there are not enough text documents in the log table at the day and time given, the index is not updated.

The syntax is described in "Setting the frequency of index updates" on page 240.

NONE

No further index updates are made. This is intended for a text column in which there will be no further changes.

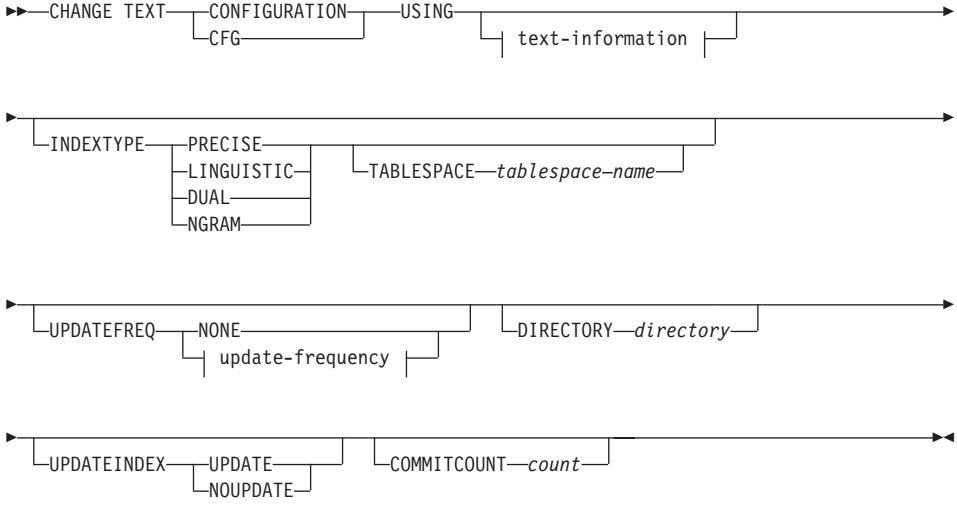
If you do not specify the UPDATEFREQ keyword, the frequency settings are left unchanged.

CHANGE TEXT CONFIGURATION

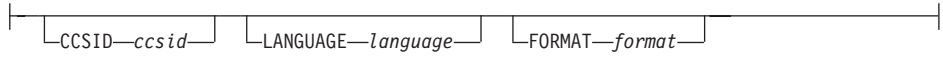
This command changes the default settings of the text configuration that is used when a database is enabled. These are the *text configuration* settings. The initial text configuration settings when Text Extender is installed are described in "Text configuration settings" on page 233.

To change these settings for a particular database **after** the database has been enabled, use "CHANGE INDEX SETTINGS" on page 109.

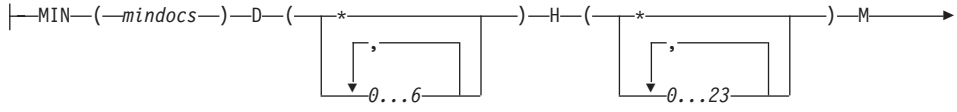
Command syntax



text-information:



update-frequency:



Command parameters

INDEXTYPE

To change the default index type, choose one of the following. For more information, see "Types of index" on page 11.

PRECISE

Terms are indexed and searched for exactly as they occur in the text documents.

LINGUISTIC

Terms are processed linguistically before being indexed. Search terms are also processed linguistically before the search begins.

DUAL Terms are indexed exactly as they occur in the text documents, and they are also indexed after being processed linguistically. When searching, you can decide for each term whether to search for the precise term or for the linguistically processed term.

NGRAM

Terms are indexed by parsing sets of characters rather than by using a dictionary. This dictionary type is mandatory if the documents you are indexing contain DBCS characters, although an Ngram index can also be used for SBCS documents.

TABLESPACE tablespace–name

Specify the name of an existing tablespace. The tablespace is used to hold the index-specific administration tables created by Text Extender (like the log tables). For large tables, use a separate tablespace. If you do not specify a tablespace, the tables are created in the DB2 default tablespace.

UPDATEFREQ update-frequency

The index update frequency in terms of when the update is to be made, and the minimum number of text documents that must be queued in the log table. If there are not enough text documents in the log table at the day and time given, the index is not updated.

The syntax is described in "Setting the frequency of index updates" on page 240.

NONE
No further index updates are made. This is intended for a text column in which there will be no further changes.

DIRECTORY directory
The directory in which the text index is to be stored.

UPDATEINDEX
A keyword that determines whether the text documents are indexed immediately after the command using this option has completed, without waiting for the next periodic indexing set by UPDATEFREQ. These commands are ENABLE TEXT COLUMN, and ENABLE TEXT FILES.

UPDATE
Indexing of the text documents occurs immediately after the command has completed.

NOUPDATE
Indexing occurs at a time set by the update frequency settings specified either in this command by UPDATEFREQ, or by the text configuration setting.

COMMITCOUNT count
A value from 500 to 1000000 indicating the number of inserts or updates after which a DB2 UDB for OS/390 intermediate commit statement is issued. This can avoid a situation in which there is insufficient log space when enabling large tables, or columns, or a large number of external files.

CCSID ccsid
The Coded Character Set Identifier to be used when indexing text documents.

For information about CCSIDs that can be supported, see "CCSIDs" on page 237.

LANGUAGE language
The language in which the text is written. This determines which dictionary is to be used when indexing text documents and when searching in text documents. "Chapter 3. Linguistic processing" on page 17 describes how dictionaries are used.

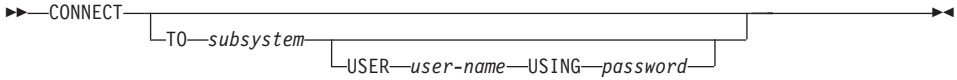
The supported languages are listed in "Languages" on page 236.

FORMAT format
The type of text document stored, such as WordPerfect, or ASCII. Text Extender needs this information when indexing documents. The document formats supported are listed in "Formats" on page 235.

CONNECT

This command connects Text Extender to a subsystem.

Command syntax



Command parameters

TO subsystem
The subsystem to connect to.

USER user-name
If no user name is specified, it is retrieved from the operating system.

USING password
A password is required only if a user name is specified.

CONNECT no operand
If you do not specify an operand and there is no connected subsystem, CONNECT makes an implicit connection to the subsystem specified in the environment variable DB2DBDFT. If you do not specify an operand and there is a connected subsystem, CONNECT displays information about the current database.

Usage notes

When you issue a DB2TX command without already being connected to a subsystem, Text Extender connects to the subsystem specified in the environment variable DB2DBDFT.

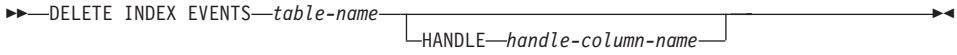
To explicitly connect to a particular subsystem, issue the CONNECT TO command.

You can be connected to only one subsystem at a time; this is called the current subsystem. In interactive mode, a connection lasts until another CONNECT TO statement changes the subsystem, or until a QUIT command is issued. In command line mode, a CONNECT command has no effect.

DELETE INDEX EVENTS

This command deletes indexing events from an index's log table for a given handle column or table.

Command syntax



Command parameters

table-name
The name of the text table in the connected database whose error events are to be deleted from the log table. The name must include an explicit schema name (qualifier) unless the schema name is the same as your user ID.

HANDLE handle-column-name
The name of the handle column whose messages are to be deleted from the log table.

Usage notes

If a handle column name is given, the indexing events for only this column are deleted.

DISABLE SERVER

This command resets any preparation work done by Text Extender for a server and disables all text tables for use by Text Extender.

Command syntax

Command parameters

None.

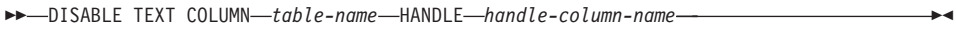
Usage notes

This command resets the connected server so that it can no longer be searched by Text Extender; that is, it disables all Text Extender text tables and text columns in the server. All modifications that were made in the server to enable Text Extender text tables, text columns, and external files are reset: all related text indexes are deleted, the Text Extender catalog view TEXTCOLUMNS in the server is deleted, and all Text Extender triggers are deleted.

DISABLE TEXT COLUMN

This command disables a text column for use by Text Extender.

Command syntax



Command parameters

table-name
The name of the text table in the connected database that contains the column to be disabled. The name must include an explicit schema name (qualifier) unless the schema name is the same as your user ID.

HANDLE handle-column-name
The name of the handle column to be disabled for use by Text Extender.

Usage notes

The index is deleted.

The log table used to record changes in the handle column (inserts, updates, and deletions) is deleted.

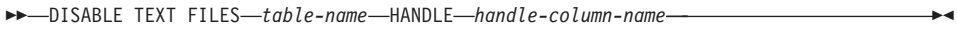
The triggers that write entries to the log table are deleted.

The handle column is not changed.

DISABLE TEXT FILES

This command disables a set of external text files for use by Text Extender.

Command syntax



Command parameters

table-name
The name of the text table in the connected database that contains the handle column for the external text files to be disabled. The name must include an explicit schema name (qualifier) unless the schema name is the same as your user ID.

HANDLE handle-column-name
The name of the handle column to be disabled for use by Text Extender.

Usage notes

The index is deleted.

The log table used to record changes in the handle column (inserts, updates, and deletions) is deleted. The triggers that write entries to the log table are also deleted.

DISABLE TEXT TABLE

This command disables all the text columns in a table for use by Text Extender.

Command syntax

Command parameters

table-name
The name of the text table in the connected database that contains the column to be disabled. The name must include an explicit schema name (qualifier) unless the schema name is the same as your user ID.

Usage notes

This command makes all the text columns in the table unusable by Text Extender.

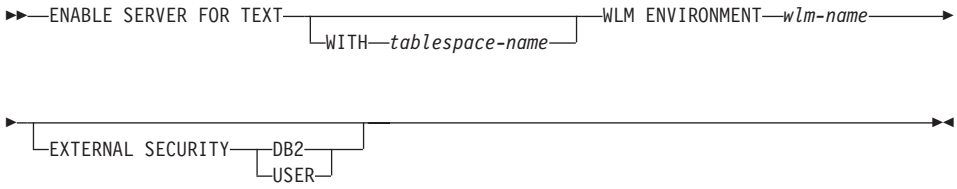
If the text columns in this table were enabled individually by ENABLE TEXT COLUMN, it deletes all their associated text indexes. (To disable text columns and delete their associated text indexes individually, use the DISABLE TEXT COLUMN command.) If the text columns in this table were enabled together by ENABLE TEXT TABLE, there is one common index for all the text columns. This command deletes the common index.

The log tables used to record changes in the text columns (inserts, updates, and deletions) are deleted. The triggers that write entries to the log table are deleted.

ENABLE SERVER

This command enables the current server to store text data.

Command syntax



Command parameters

tablespace-name
The name of the table spaces in which administrative support tables and their names are stored. The table space definition has two parts:

- Table space for administrative support tables that store attribute data. The table space name should be the name of a table space defined in the MMDBSYS database. You can specify a NULL value for this table space to get the system default. However, specifyinng a single segmented table space is more efficient.
- Table space in which indexes are created on the administrative support tables that store attribute data. You can specify a NULL value for this table space to get the system default.

wlm-name
WLM environment name. See the *Program Directory* for more information on how to set up the WLM environment.

EXTERNAL SECURITY DB2, EXTERNAL SECURITY USER.
Indicates how the UDFs interact with an external security product such as RACF to control access to files. UDFs that use files include import and export UDFs such as CONTAINS. They do not include attribute retrieval UDFs such as FORMAT. You can specify USER or DB2.

If you specify USER, each UDF executes as if it has the user ID (that is, the primary authorization ID) of the process that invoked it, and has permission as defined for that user ID on the OS/390 server.

If you specify DB2, UDF access to the files is performed using the authorization ID established for the WLM envirnment that executes file-accessing UDFs. All extender UDF invokers have access to the same files. DB2 is the default.

Usage notes

You must be connected to a subsystem, either explicitly or implicitly, before issuing this command (see "CONNECT" on page 114). This command prepares the connected subsystem for use by Text Extender. It is a mandatory step before a Text Extender text table or text column can be enabled in the subsystem.

ENABLE SERVER creates a Text Extender catalog view called DB2TX.TEXTINDEXES, described in "Working with the Text Extender catalog view" on page 70, and a catalog view called DB2TX.TEXTCOLUMNS used for "performance" queries.

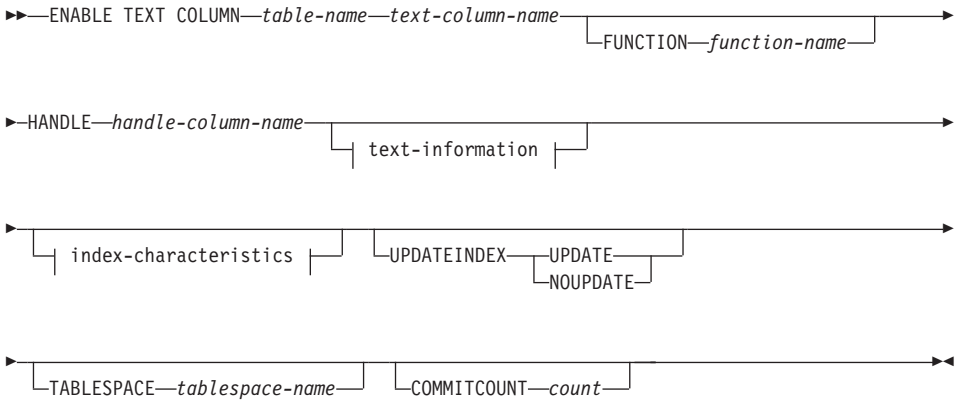
It also creates text configuration settings, described in "Text configuration settings" on page 233.

Some other administration work is also done, such as the declaration of UDTs and UDFs.

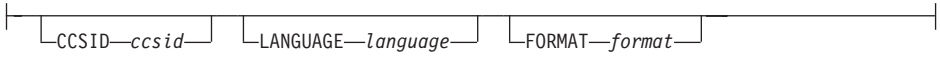
ENABLE TEXT COLUMN

This command enables a text column for use by Text Extender.

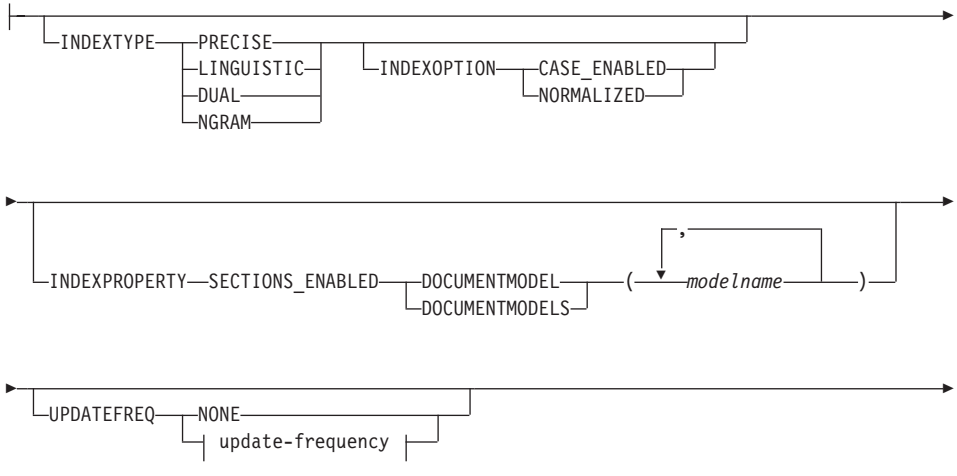
Command syntax

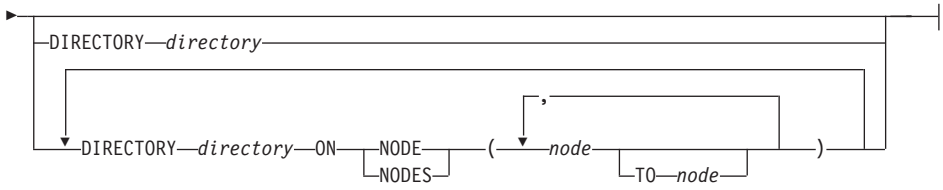


text-information:

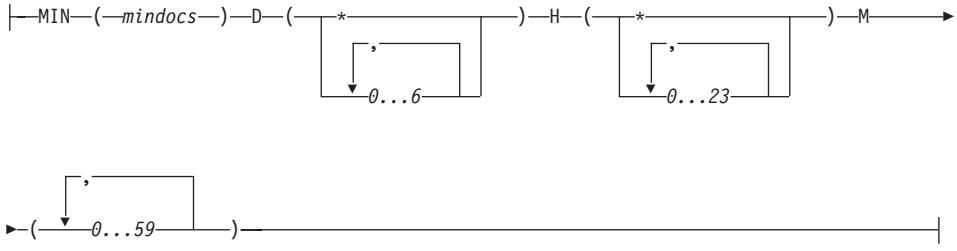


index-characteristics:





update-frequency:



Command parameters

table-name
The name of the text table in the connected database that contains the column to be enabled. The name must include an explicit schema name (qualifier) unless the schema name is the same as your user ID.

text-column-name
The name of the column to be enabled for use by Text Extender. This column must be of the type CHAR, VARCHAR, LONG VARCHAR, CLOB, DBCLOB, GRAPHIC, VARGRAPHIC, or LONG VARGRAPHIC. If the document type is not one of these, use FUNCTION to convert the document type.

FUNCTION function-name
The name of a user-defined function to be used by the Text Extender library services to access text documents that are in a column that is not of type CHAR, VARCHAR, LONG VARCHAR, CLOB, DBCLOB, GRAPHIC, VARGRAPHIC, or LONG VARGRAPHIC. See “Enabling text columns of a nonsupported data type” on page 53 for more information.

HANDLE handle-column-name
The name of the handle column to be added to the table for use by Text Extender’s UDFs.

CCSID ccsid
The Coded Character Set Identifier to be used when indexing text documents.

For an Ngram index, the CCSID must be the same as the CCSID of the database. To find the default CCSID, use:

```
db2tx get text cfg
```

The installation default is the database CCSID.

If this keyword is not specified, the CCSID specified in the text configuration settings is used. Subsequent changes to the text configuration settings are ignored; the value used is the one that existed at the time the column was enabled, not the one that exists when indexing text documents.

For information about other CCSIDs that can be supported, see "CCSIDs" on page 237.

LANGUAGE language

The language in which the text is written. This determines which dictionary is to be used when indexing text documents and when searching in text documents. "Chapter 3. Linguistic processing" on page 17 describes how dictionaries are used.

This keyword specifies the language once for the whole column. You can override this value for individually inserted text documents using the INIT_TEXT_HANDLE function in an INSERT statement.

If this keyword is not specified, the language specified in the text configuration settings is used. Subsequent changes to the text configuration settings are ignored; the value used is the one that existed at the time the column was enabled, not the one that exists when indexing text documents.

The supported languages are listed in "Languages" on page 236.

FORMAT format

The type of text document stored, such as WordPerfect, or ASCII. Text Extender needs this information when indexing documents. The document formats supported are listed in "Formats" on page 235.

The document formats supported for structured documents are:

- ASCII_SECTIONS

  Documents having the format ASCII_SECTIONS cannot contain nested sections. (For information about nested sections, see "Working with structured documents" on page 54.) A start tag for a section is ended by the next start tag.

- HTML

A sample document model file is provided for HTML documents. It contains a subset of the standard HTML definitions, which you can modify if required. HTML documents cannot contain nested sections.

For these formats, you must specify the structure information in a document model file. See "Working with structured documents" on page 54. If the format TDS and INDEXPROPERTY SECTION_ENABLED are specified, it is assumed that the document format is ASCII_SECTIONS.

Tags that are not defined in the model file are indexed in the normal way, according to the index type.

This keyword specifies the format once for the whole column. You can override this value for individually inserted text documents using the INIT_TEXT_HANDLE function in an INSERT statement.

If this keyword is not specified, the format specified in the text configuration settings is used. Subsequent changes to the text configuration settings are ignored; the value used is the one that existed at the time the column was enabled, not the one that exists when indexing text documents.

INDEXTYPE

The type of index to be created. For more information, see "Types of index" on page 11.

PRECISE

Terms are indexed and searched for exactly as they occur in the text documents.

LINGUISTIC

Terms are processed linguistically before being indexed. Search terms are also processed linguistically before the search begins.

DUAL Terms are indexed exactly as they occur in the text documents, and they are also indexed after being processed linguistically. When searching, you can decide for each term whether to search for the precise term or for the linguistically processed term.

NGRAM

Terms are indexed by parsing sets of characters rather than by using a dictionary. This index type is mandatory if the documents you are indexing contain DBCS characters, although an Ngram index can also be used for SBCS documents.

If you do not specify the INDEXTYPE keyword, the value in the text configuration settings is used.

The dual index type cannot be used to take advantage of document structure.

Documents in XML format are not supported for Ngram indexes.

INDEXOPTION
Options to be used when creating the index.

CASE_ENABLED
This option is available **only for Ngram indexes**. Normally, Ngram indexes do not allow a case-sensitive search. By specifying CASE_ENABLED, you ensure that documents are indexed such that a case-sensitive search is possible. For more information see "Ngram index" on page 14.

NORMALIZED
This option is available **only for precise indexes**. A normalized precise index differs from a precise index in that:

- It is not case-sensitive; all words except those in all uppercase are converted to lowercase.
- Words in all uppercase are not subject to stop-word filtering; the abbreviation UK, for example, is indexed.
- English language search terms may be expanded to include lemma forms using a heuristic algorithm, so that a search for `house` also searches for `houses`.

INDEXPROPERTY SECTIONS_ENABLED DOCUMENTMODEL(S) model-name
Properties of a selected index type.

SECTIONS_ENABLED specifies that the selected index type can contain information about the document structure.

DOCUMENTMODEL/DOCUMENTMODELS *model-name* specifies the model or models to be associated as default for the documents to be indexed. A model name must be specified if the index property SECTIONS_ENABLED is used. If a list of models is specified, the first model is used as the default model for the index. The default model is used during indexing if the document has no reference to a model, or if no model is specified during search.

The characters that can be used for the model name are a-z, A-Z, and 0-9.

The specified model name must correspond to a model definition in the model definition file `desmodel.ini`.

To change the model or models associated with an index,

1. Use DISABLE TEXT COLUMN to disable the index
2. Use ENABLE TEXT COLUMN to reindex the documents, specifying different document model names.

UPDATEFREQ update-frequency

The index update frequency in terms of when the update is to be made, and the minimum number of text documents that must be queued in the log table. If there are not enough text documents in the log table at the day and time given, the index is not updated.

The syntax is described in "Setting the frequency of index updates" on page 240.

If you do not specify UPDATEFREQ, the default frequency specified in the text configuration settings is used.

Tip

If you have many tables, consider avoiding the use of the default values. By making individual update frequency settings for tables you can avoid indexing all the tables simultaneously and causing an unnecessarily prolonged load on your system resources.

NONE

No further index updates are made. This is intended for a text column in which there will be no further changes.

These update frequency settings are ignored if they have already been set for the whole table by ENABLE TEXT TABLE.

DIRECTORY directory

The directory path in which the text index is to be stored. The specified path is concatenated with ""txins*nnn*" where *nnn* is the node number.

This is an existing directory on the system where the Text Extender server is running.

If you do not specify the DIRECTORY keyword, the value of the DIRECTORY setting in the text configuration settings is used.

This setting is ignored if it has already been set for the whole table by ENABLE TEXT TABLE.

UPDATEINDEX

A keyword that determines whether the text documents associated

with this handle column are indexed immediately after this command has completed, without waiting for the next periodic indexing set by UPDATEFREQ.

UPDATE
Indexing of the text documents occurs immediately after this command has completed.

NOUPDATE
Indexing occurs at a time set by the update frequency settings specified either in this command by UPDATEFREQ, or by the text configuration setting.

If you do not specify this keyword, the value in the text configuration settings is taken.

COMMITCOUNT count
A value from 500 to 1000000 indicating the number of inserts or updates after which DB2 UDB for OS/390 must issue an intermediate commit statement. This can avoid a situation in which there is insufficient log space when enabling large tables, or columns, or a large number of external files.

Usage notes

This command adds a handle column to the specified DB2 table. Each handle column is associated with a text column, and is used by Text Extender's UDFs.

If this table has not already been enabled to create a common index, an index is created that is associated with this text column.

Also, a log table is created in the database. The log table is used to record changes to the text column, that is inserts, updates, and deletions. Insert, update, and delete triggers are defined for the text column to keep the log table up to date automatically.

If the text column that you are enabling belongs to a table that is part of a multiple-node nodegroup, the index directory that you specify must be available on all physical nodes. If you use the default directory specified in the text configuration, make sure that the path is available on all nodes of the nodegroup. If this is not convenient, you can specify a specific path for each node in the ENABLE TEXT COLUMN command.

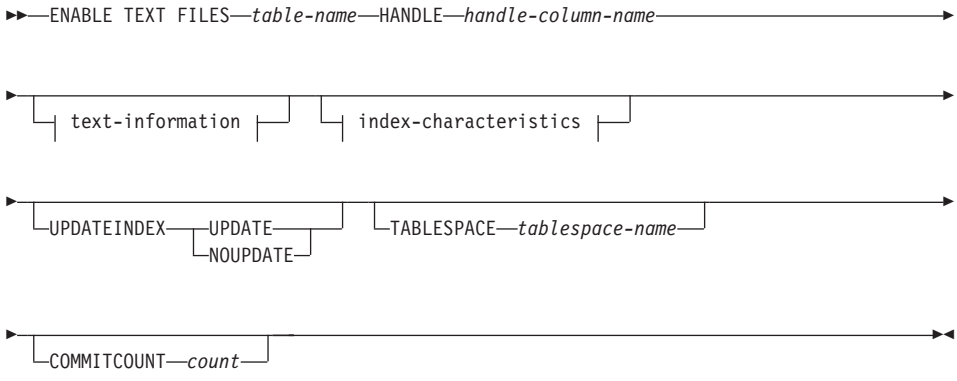
If you change the node configuration of a nodegroup that contains a table that is enabled for Text Extender, you must reindex the table.

ENABLE TEXT FILES

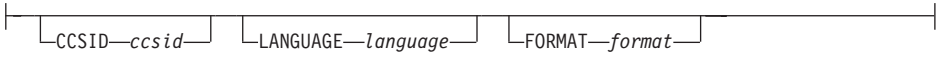
This command enables Text Extender to search in text files that are not in a DB2 UDB for OS/390 database.

> **Tip**
> This command cannot be used if the text columns in the table share a common index, as described in "Enabling a text table" on page 46.

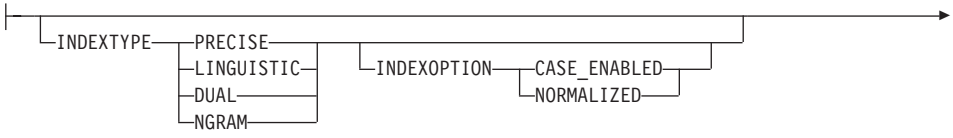
Command syntax

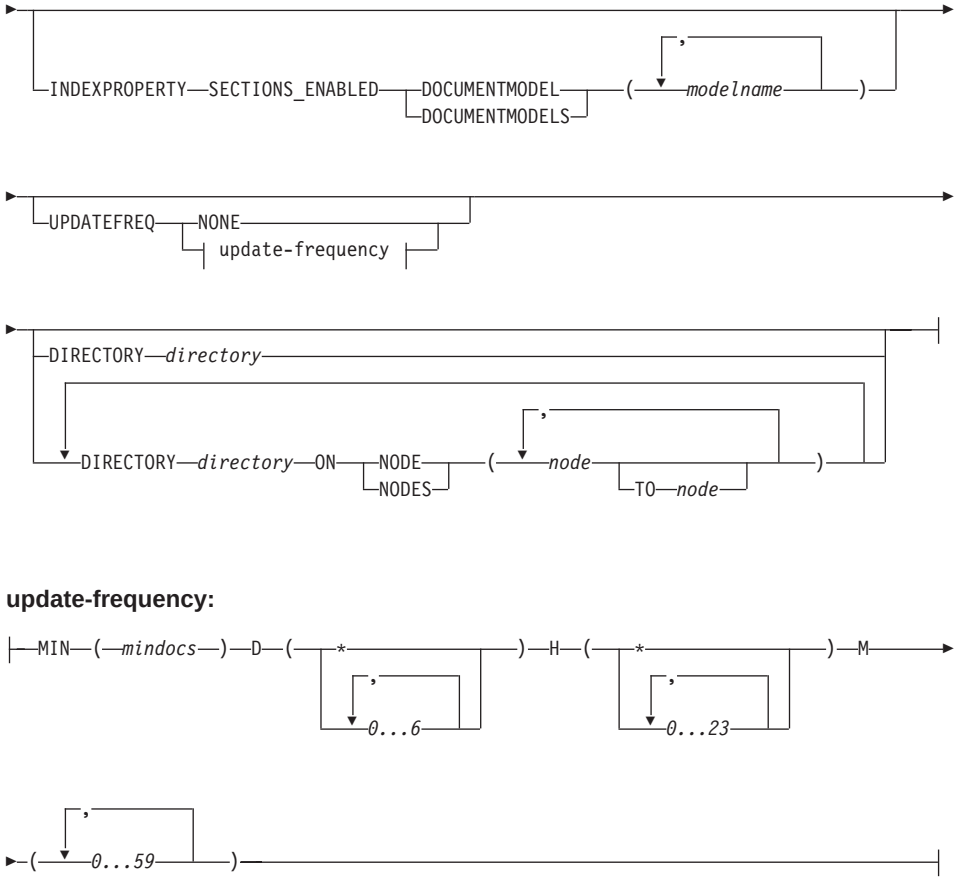


text-information:



index-characteristics:





Command parameters

table-name
The name of the text table in the connected database that is to be associated with the external text files to be indexed. The name must include an explicit schema name (qualifier) unless the schema name is the same as your user ID.

For a description of the other command parameters, see "ENABLE TEXT COLUMN" on page 122.

Usage notes

This command adds a handle column to the specified DB2 table. Each handle column is associated with a collection of external text files, and is used by Text Extender's UDFs. An index is created that is associated with these files.

After you have enabled the text files, initialize handles in the handle column using INIT_TEXT_HANDLE. Then fill the index using UPDATE INDEX.

You cannot reuse a handle column name if that name has been used before in ENABLE TEXT FILES to identify a handle column of a text column.

A log table is created for recording changes to the files, but you must activate the triggers manually to record these changes because DB2 UDB for OS/390 does not have the files under its control and is therefore not aware of such changes. See “Updating an index for external files” on page 60 for a description of how to do this.

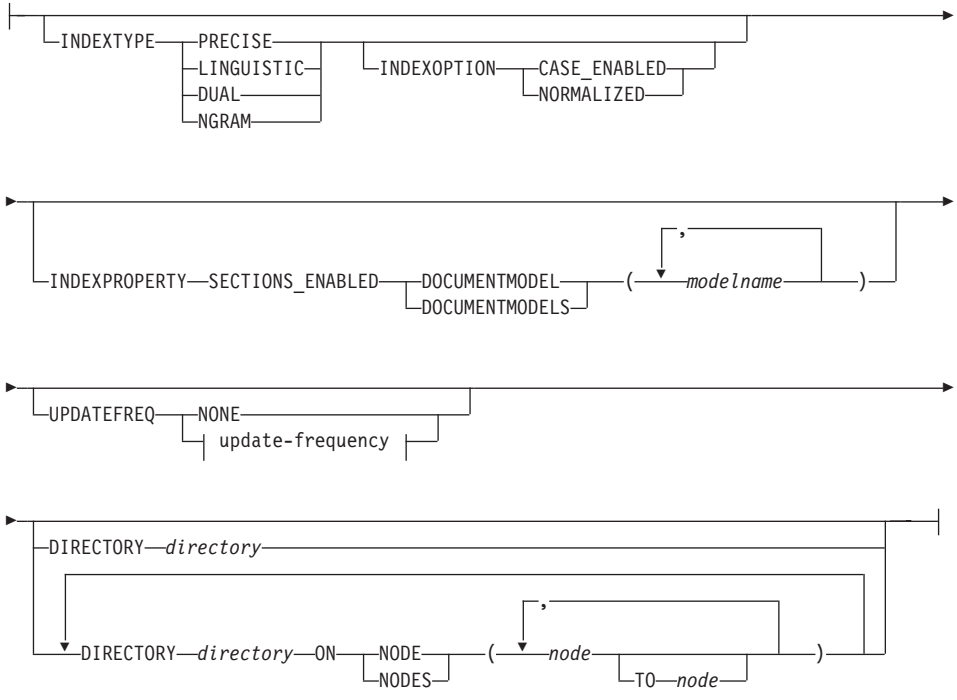
If you run out of log space in this step, see “Enabling a text column in a large table” on page 52 for possible solutions.

ENABLE TEXT TABLE

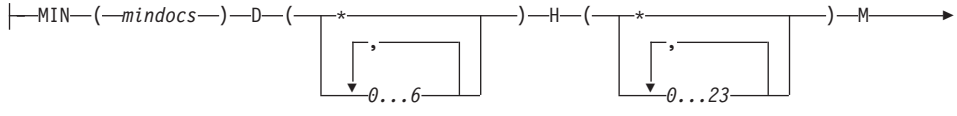
Creates a common index for use by any of the table's text columns that are later enabled. The table is then a common-index table. A table that does not get enabled in this way, where the text columns that are later enabled create their own individual indexes, is a multi-index table.

Command syntax

index-characteristics:



update-frequency:



Command parameters

table-name
The name of the text table to be enabled in the connected database. The name must include an explicit schema name (qualifier) unless the schema name is the same as your user ID.

INDEXTYPE
The type of index to be created. For more information, see "Types of index" on page 11.

PRECISE
Terms are indexed and searched for exactly as they occur in the text documents.

LINGUISTIC
Terms are processed linguistically before being indexed. Search terms are also processed linguistically before the search begins.

DUAL Terms are indexed exactly as they occur in the text documents, and they are also indexed after being processed linguistically. When searching, you can decide for each term whether to search for the precise term or for the linguistically processed term.

NGRAM
Terms are indexed by parsing sets of characters rather than by using a dictionary. This dictionary type is mandatory if the documents you are indexing contain DBCS characters, although an Ngram index can also be used for SBCS documents.

If you do not specify the INDEXTYPE keyword, the text configuration is used.

INDEXOPTION
Options to be used when creating the index.

CASE_ENABLED
This option is available **only for Ngram indexes**. Normally, Ngram indexes do not allow a case-sensitive search. By specifying CASE_ENABLED, you ensure that documents are indexed such that a case-sensitive search is possible. For more information see "Ngram index" on page 14.

INDEXPROPERTY SECTIONS_ENABLED DOCUMENTMODEL(S) model-name

Properties of a selected index type.

SECTIONS_ENABLED specifies that the selected index type can contain information about the document structure.

DOCUMENTMODEL/DOCUMENTMODELS *model-name* specifies the model or models to be associated as default for the documents to be indexed. A model name must be specified if the index property SECTIONS_ENABLED is used. If a list of models is specified, the first model is used as the default model for the index. The default model is used during indexing if the document has no reference to a model, or if no model is specified during search.

The characters that can be used for the model name are a-z, A-Z, and 0-9.

The specified model name must correspond to a model definition in the model definition file `desmodel.ini`.

To change the model or models associated with an index,

1. Use DISABLE TEXT TABLE to disable the index
2. Use ENABLE TEXT TABLE to reindex the documents, specifying different document model names.

UPDATEFREQ update-frequency

The index update frequency in terms of *when* the update is to be made, and *how many text documents must be queued* in the log table. If there are not enough text documents in the log table at the day and time given, the index is not updated.

The syntax is described in "Setting the frequency of index updates" on page 240.

If you do not specify UPDATEFREQ, the default frequency specified in the text configuration settings is used.

NONE

No further index updates are made. This is intended for a text column in which there will be no further changes.

> **Tip**
> If you have many tables, consider avoiding the use of the default values. By making individual update frequency settings for tables you can avoid indexing all the tables simultaneously and causing an unnecessarily prolonged load on your system resources.

DIRECTORY directory

The directory path in which the text index is to be stored. The specified path is concatenated with ""txins*nnn*" where *nnn* is the node number.

This is an existing directory on the system where the Text Extender server is running.

If you do not specify the DIRECTORY keyword, the value of the DIRECTORY setting in the text configuration settings is used.

Usage notes

A new text index is created that is associated with all the text columns in this table. You do this when you want to have one common index for all the text columns of a table, rather than a separate index for each text column.

When you have enabled a table, you must then run ENABLE TEXT COLUMN for each of the text columns in which you want to search.

A log table is created in the database. The table is used to record changes, that is , inserts, updates, and deletions, in the text columns that are later enabled.

When a text column is enabled, triggers are created that monitor changes to the text and automatically keep a record in the log table of which documents need to be indexed.

Text Extender indexes the text documents listed in the log table periodically as specified by the UPDATEFREQ keyword.

GET ENVIRONMENT

This command displays the settings of the environment variables.

Command syntax

Command parameters

None.

Usage notes

These are the environment variables displayed:

DB2DBDFT
Default subsystem name.

DB2TX_INSTOWNER
Text Extender instance name.

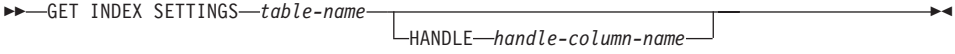
DB2TX_INSTOWNERHOMEDIR
Instance owner's home directory.

GET INDEX SETTINGS

This command displays the settings of an index, showing the following:

- Index type
- Index option [optional]
- Update index option
- Index directory
- Update frequency
- Default model.

Command syntax



Command parameters

table-name
The name of the text table in the connected database whose index settings are to be displayed. The name must include an explicit schema name (qualifier) unless the schema name is the same as your user ID.

HANDLE handle-column-name
The name of the handle column whose index settings are to be displayed.

Usage notes

If the table is enabled as a multi-index table, this command displays the index settings of all enabled text columns in the table. If a *handle-column-name* is provided, this command displays the index settings of the specified column.

If the table is a common-index table, the settings of the common index are displayed. If a *handle-column-name* is provided, it is ignored.

If the table or column is enabled with the index property SECTIONS_ENABLED, the command GET INDEX SETTINGS displays the default model for the index. The default model is the model name you specified during enabling or the first model name in a list of model names. Here is an example:

```
Current index settings:

      Index type              (INDEXTYPE)  = LINGUISTIC
      Default model        (DOCUMENTMODEL)  = mymodel
      Update index option    (UPDATEINDEX)  = UPDATE
```

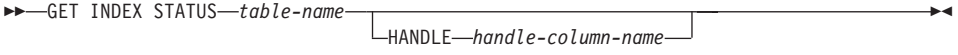
```
Update frequency          (UPDATEFREQ)  = NONE
Node 1
Index directory            (DIRECTORY)  = /home/user1/db2tx/indices
```

GET INDEX STATUS

This command displays the following index status information for a given handle column or table:

- Whether the search function is available
- Whether the index update function is available
- Whether the reorganize function is available
- The number of scheduled documents
- The number of indexed documents
- The number of indexed documents in the primary index
- The number of indexed documents in the secondary index
- Error events.

Command syntax



Command parameters

table-name
The name of the text table in the connected database that contains the text columns whose status is to be displayed. The name must include an explicit schema name (qualifier) unless the schema name is the same as your user ID.

HANDLE handle-column-name
The name of the handle column whose status is to be displayed.

Usage notes

For a multi-index table, you must specify the name of the handle column.

GET STATUS

This command displays information about the enabled status of subsystems, tables, or text columns.

Command syntax

Command parameters

None.

Usage notes

This command displays whether the server is enabled, the names of the enabled text tables in the subsystem, the names of the enabled text columns and their associated handle columns, and the names of external-file handle columns.

GET TEXT CONFIGURATION

This command displays the default settings for the text configuration for the connected database.

To change these default settings, use "CHANGE TEXT CONFIGURATION" on page 111.

Command syntax

Command parameters

None.

Usage notes

For an example of the text configuration information, see "Displaying the text configuration settings" on page 65.

GET TEXT INFO

This command displays the text information settings for text columns:

- CCSID
- Language
- Format.

Command syntax

Command parameters

table-name
The name of the text table in the connected database that contains the text columns whose text information settings are to be displayed. The name must include an explicit schema name (qualifier) unless the schema name is the same as your user ID.

HANDLE handle-column-name
The name of the handle column whose text information settings are to be displayed.

Usage notes

If a handle column name is given, the text information for only this column is displayed.

If a handle column name is not given, the text information for each enabled column in this table is displayed.

QUIT

This command stops the Text Extender command line processor and returns control to the operating system.

Command syntax

Command parameters

None.

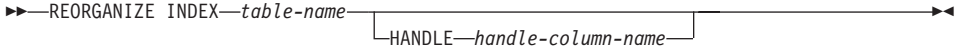
Usage notes

The connection to the database is terminated.

REORGANIZE INDEX

If a text column is often updated, searching the index can become inefficient. To make searching effient again, the index has to be *reorganized*. Although Text Extender recognizes when an index needs to reorganized and does so in the background automatically, there may be situations that require an index to be reorganized manually using REORGANIZE INDEX. You can use the command GET INDEX STATUS to find out if an index needs to be reorganized.

Command syntax



Command parameters

table-name
The name of the text table in the connected database whose index is to be reorganized. The name must include an explicit schema name (qualifier) unless the schema name is the same as your user ID.

HANDLE handle-column-name
The name of the handle column whose index is to be reorganized.

Usage notes

For a multi-index table, you must specify a handle column name.

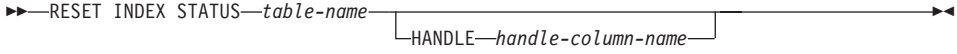
Although searches can be made on the index while REORGANIZE INDEX is running, index updates cannot.

RESET INDEX STATUS

When the index status of a table or column shows `Search not available` or `Update not available`, an error has occurred during indexing that prevents you working with the index.

This command resets the index status so that you can continue to work with it. Before resetting the index status, check for any errors that may be logged in the index's log table (see "Displaying error events" on page 67).

Command syntax



Command parameters

table-name
The name of the text table in the connected database that contains the text columns whose status is to be reset. The name must include an explicit schema name (qualifier) unless the schema name is the same as your user ID.

HANDLE handle-column-name
The name of the handle column whose status is to be reset.

Usage notes

For a multi-index table, you must specify a handle column name.

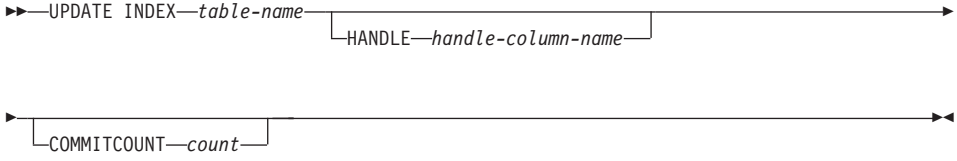
For a common-index table, each enabled column in this table is reset.

UPDATE INDEX

This command starts indexing immediately. It brings the index up to date to reflect the current contents of the text column(s) with which the index is associated.

To have updates on external files reflected in the index, you must force a "change" entry to be placed in the log table by issuing an update statement on the corresponding handle column. See "Updating an index for external files" on page 60 for an example.

Command syntax



Command parameters

table-name
The name of the text table in the connected database that contains the text column whose index is to be updated. This can also be the name of a common-index table. The name must include an explicit schema name (qualifier) unless the schema name is the same as your user ID.

HANDLE handle-column-name
If this is a common-index table, the *handle-column-name* is not required and is ignored. The index to be updated is associated with the whole table and not with an individual text column.

If this is a multi-index table, then *handle-column-name* is the name of the handle column whose index is to be updated.

COMMITCOUNT count
A value from 500 to 1000000 indicating the number of inserts or updates after which DB2 UDB for OS/390 must issue an intermediate commit statement. This can avoid a situation in which there is insufficient log space when enabling large tables, or columns, or a large number of external files.

Chapter 8. Administration commands for the server

This chapter describes the syntax of the administration commands for the server. Server administration consists of tasks you can do to start, stop, and check the status of the Text Extender server, and to create a sample database and sample tables. "Chapter 4. Administration" on page 37 describes how to use these commands.

Command	Purpose	Page
TXICRT	Creates a Text Extender instance	148
TXIDROP	Drops a Text Extender instance	149
TXSTART	Starts the Text Extender services	150
TXSTATUS	Displays the status of the search service	151
TXSTOP	Stops the Text Extender services	152
TXTHESC	Compiles a thesaurus definition file	153
TXTRACE	Produces trace information	155

Tip

If you installed Text Extender in a directory other than the default `/usr/lpp/db2tx`, you must customize the LPPDIR variable in the following script files:

TXICRT
TXIDROP
TXISTART
TXISTATUS
TXISTOP

Set up the LPPDIR variable to the same directory you set in the sample SMP/E job DESDDDEF in the CHANGE PATH variable.

TXICRT

This command creates a Text Extender instance for a Text Extender server or client.

Command syntax

TXIDROP

This command drops a Text Extender instance together with all its indexes.

Command syntax

Usage notes

Before dropping an instance, disable the associated subsystem.

TXSTART

This command starts the Text Extender services.

Command syntax

Usage notes

Run this command:

- While logged on with a user ID in the SM administration group
- Whenever you stop and restart your server system
- After starting DB2.

TXSTATUS

This command displays whether Text Extender is up and running.

Command syntax

TXSTOP

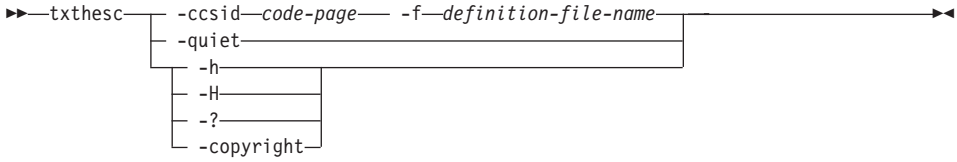
This command stops the Text Extender services.

Command syntax

TXTHESC

This command compiles a thesaurus definition file. This thesaurus can be used only for searches on precise or linguistic indexes.

Command syntax



Command parameters

-f *definition-file-name*
The name of the SGML file containing the thesaurus definition. The file name must contain either the absolute path of the relative path to the file.

The thesaurus dictionary is generated in the same directory as the definition file. It has the same name as the definition file but with the extensions `th1` through `th6`.

> **Tip**
> Because thesaurus files are overwritten when they have the same names, use a separate directory for each thesaurus.

-ccsid *code-page*
The code page in which the thesarus definition file is written. Currently, only code page 850 is supported.

-quiet Output information is not displayed.

-copyright
Returns the internal build number of the product. Use this number when reporting problems.

-h, -H, or -?
Displays help information.

Usage notes

Use this command to compile a standard thesaurus definition file into a binary thesaurus definition format. The definition file must be in SGML format.

To use a compiled thesaurus file, move it to the dictionary directory of the server instance, then specify the location of the files during searching.

The dictionary directory is:

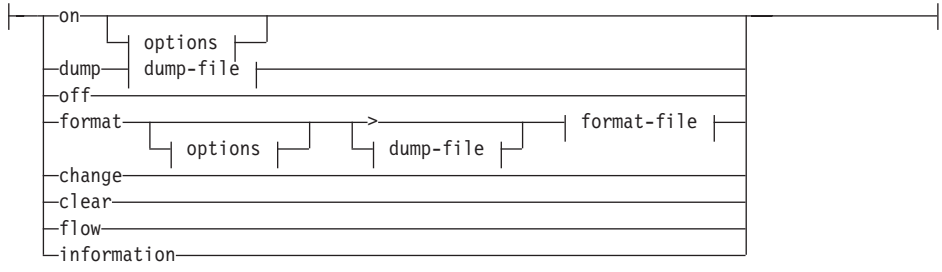
DB2TX_INSTOWNER /db2tx/dicts

TXTRACE

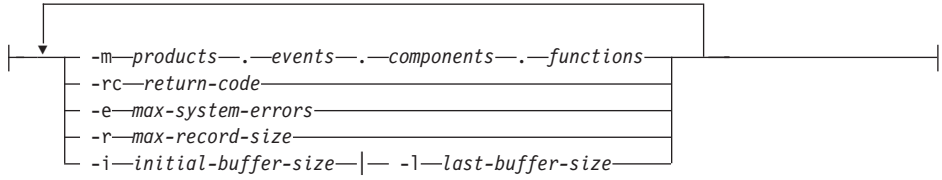
This command writes processing information to a trace buffer in shared memory. This information can be used for tracing faults. It can be written in binary from the trace buffer to a file for later formatting when tracing has been switched off, or can be formatted and written to a file while tracing is still on.

Command syntax

parameters:



options:



dump-file:

format-file:

Command parameters

Note:

A -u option is also available with all of the TXTRACE parameters to display information about the parameter.

on To start the trace facility.

dump | dmp
To write the trace information in binary to a file.

off To stop the trace facility.

format | fmt
To format the binary trace information. You can format the dump file, when tracing is switched off, by specifying the name of the dump file and the name of the file to hold the formatted trace information. To format the trace information directly from the trace buffer while tracing is still switched on, enter: `destrc format > filename.tmp`.

change | chg
To change the trace mask, maxSysErrors, or maxRecordSize.

clear | clr
To clear the trace.

flow | flw
To show control flow of the trace.

information | info | inf
To get information about the trace.

options
To filter the trace information either when turning tracing on (this reduces the shared memory usage), or when formatting the trace information. Unless the trace is very large, it is usually easier to write the full trace information and then filter it during formatting.

-m To add a "mask" to specify which events, components, and functions are to be included in the trace. The default is to trace everything. The mask is in four parts, separated by periods; for example: `2.2-6.1,3.*` You can specify a range using "-" as a separator character, or a list using "," as a separator character. For example: `2-6` includes only the events

whose IDs are in the range from 2 to 6. To include only components 2 *and* 6, specify `2,6`

products

Product ID. The product ID for Text Extender is "2". The product ID for TextMiner is "3".

events The set of event types to be included in the trace:

0 system_error

1 system_error

2 system_error

3 non-fatal_error

4 non-fatal_error

5 api_errcode

7 fnc_errcode

8 trap error

10 api_entry

11 api_exit

13 api_retcode

15 api_data

30 fnc_entry

31 fnc_exit

33 fnc_retcode

35 fnc_data

components

The components to trace.

The component IDs for Text Extender are:

1 COMMAND_LINE_INTERFACE

2 UDF

3 STORED_PROCEDURES

4 ADMINISTRATION

5 INDEX_CONTROL

6 LIBRARY_SERVICES

7 DES_PARSER

8 DES_DEMON

9 DES_API

10 SERVICES

The component IDs for TextMiner are:

1 automachine

2 bgproc (background processing)

3 cluster

4 common

5 commsrvc (common services)

6 communic (communication)

7 daemon

8 dsclient

9 environ (environment)

10 glue

11 idxcomm (index build, common part)

12 libsrv (library services)

13 search

14 trace

15 guru

16 indexbld (index build, tm only)

17 indexeng (index engine, tm only)

18 smsearch

19 search engine, tm only)

20 tmsearch

21 gtrcm (gtr, common part)

22 gtrsrch (search, gtr only)

23 gtridx (index build, gtr only)

functions

Asterisk (*). The set of functions to trace. Use an asterisk (*) to trace all functions unless directed to do otherwise by the IBM Support Center.

-rc *return-code*
Treat *return-code* as a system error.

-e *max-system-errors*
Integer. To stop the trace after this number of errors. The default is 1 which specifies that when the first system error occurs, all subsequent tracing of lower severity events is suppressed. This is acceptable if you are interested only in the first major error, but you should specify a higher number (such as -e 50) if you want to see the full trace after the initial system error. The trace destination is shared memory.

-r *max-record-size*
Integer. To stop the trace after this number of records have been written to the trace file. The default is 16 KB.

-i *initial-buffer-size*
Integer. To keep this number of records from the beginning of the trace. If -i is specified, the default is 16 KB. On a UNIX system, a recommended buffer size is 2 MB.

If neither -i nor -l are specified, -l is the default.

If you specify -i, no wrapping occurs; no further trace entries are written if the volume of records exceeds *max-record-size*, even if you clear all trace entries. To get new trace entries written, increase the buffer size, turn the trace off and then on again.

-l *last-buffer-size*
Integer. To keep this number of records from the end of the trace. The default is 16 KB. On a UNIX system, a recommended buffer size is 2 MB.

path The directory where the corresponding file is stored.

dump-filename
The name of the file that contains the binary trace information.

formatted-filename
The name of the file that contains the formatted trace information.

Examples

See “Tracing faults” on page 72.

Chapter 9. UDTs and UDFs

Text Extender provides *user-defined functions* (UDFs) to search in text documents stored in DB2 UDB for OS/390, and to work with the results of a search. Some of the UDFs' parameters are data types known as *user-defined distinct types* (UDTs) that are provided with Text Extender.

This chapter describes the UDTs and the UDFs.

Text Extender provides a DB2 UDB for OS/390 command line processor input file called `txsample.udf`. It contains examples of Text Extender UDFs that run against the sample tables described in "The sample table DB2TX.SAMPLE" on page 76. Use this file to see examples of the syntax of the administration and search UDFs.

A summary of Text Extender UDTs

UDT	Source data type	Comments
DB2TEXTH	VARCHAR(60) FOR BIT DATA	**Text handle.** A variable-length string containing information needed for indexing a text document stored in a text column. The information in a handle includes a document ID, the name of the server where the text is to be indexed, the name of the index, and information about the text document. Handles are stored in columns that Text Extender creates and associates with each text column. The functions HANDLE and INIT_TEXT_HANDLE return this data type.

Summary of UDTs

UDT	Source data type	Comments
DB2TEXTFH	VARCHAR(210) FOR BIT DATA	**File handle.** A variable-length string containing information needed for indexing an external text file – a file stored outside of the control of DB2 UDB for OS/390. The information in a text handle includes a document ID, the name of the server where the text is to be indexed, the name of the index, information about the text file, and information about the location of the file. File handles are stored in columns that Text Extender creates and associates with each group of external files. The functions FILE and INIT_TEXT_HANDLE return this data type.

A summary of Text Extender UDFs

Search function (UDF)	Purpose	Page
CCSID	Returns the CCSID from a handle	163
CONTAINS	Makes a search for text in a particular document	164
FILE	Returns or changes the path and name of a file in an existing handle	165
FORMAT	Returns or changes the document format setting in a handle	166
INIT_TEXT_HANDLE	Returns a partially initialized handle containing information such as format and language settings	167
LANGUAGE	Returns or changes the language setting in a handle	168
NO_OF_MATCHES	Searches and returns the number of matches found	169
RANK	Searches and returns the rank value of a found text document	170
REFINE	Takes a search argument and a refining search argument and returns a combined search argument	171
SEARCH_RESULT	Returns an intermediate table with the search result of the specified search string	172

Examples of the use of UDFs are given in “Chapter 5. Searching with Text Extender UDFs” on page 75.

CCSID

The CCSID function returns the CCSID (data type SMALLINT) from a handle. This is the CCSID parameter used for indexing the corresponding text document. This is described in "CCSIDs" on page 237. It is set for each text column by the ENABLE TEXT COLUMN command.

Function syntax

Function parameters

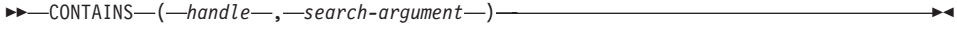
handle

An expression whose result is a value of type DB2TEXTH or DB2TEXTFH. It is usually the name of a handle column from which the CCSID setting is to be returned.

CONTAINS

The CONTAINS function searches for text in a particular text document. It returns the INTEGER value 1 if the document contains the text. Otherwise, it returns 0.

Function syntax



Function parameters

handle
An expression whose result is a value of type DB2TEXTH or DB2TEXTFH. It is usually the name of a handle column containing the handles of the text documents to be searched.

search-argument
A string of type LONG VARCHAR containing the terms to be searched for. See "Chapter 10. Syntax of search arguments" on page 173.

FILE

The FILE function does one of the following:

- Returns the path and file name in a handle
- Changes the path and file name in a handle, and returns the path and file name.

The returned handle is a value of type DB2TEXTFH.

Function syntax

Function parameters

handle
An expression whose result is a value of type DB2TEXTFH. It is usually the name of a handle column from which the file name is to be returned.

file-name
A string of type VARCHAR(150) specifying the new absolute path and file name of the external file that is to be associated with the handle. The path could be, for example, a LAN drive or an NFS-mounted drive. The file access permissions must permit access to the file by the DB2 UDB for OS/390 instance owner.

FORMAT

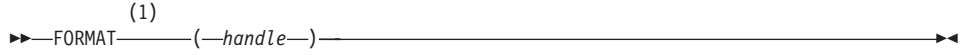
The FORMAT function does one of the following:

- Returns the document format specified in a handle
- Changes the format specification in a document's handle, and returns the changed handle.

The returned document format is a string of type VARCHAR(30). The returned handle is of type DB2TEXTH or DB2TEXTFH.

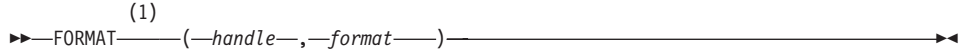
This is the format parameter used for indexing the corresponding text document. The document formats supported are listed in "Formats" on page 235.

Function syntax



Notes:

1 Returns a format value, type VARCHAR(30).



Notes:

1 Returns a handle, type DB2TEXTH or DB2TEXTFH.

Function parameters

handle

An expression whose result is a value of type DB2TEXTH or DB2TEXTFH. It is usually the name of a handle column from which the format setting is to be returned or set.

format

The new document format setting of data type VARCHAR(30).

If *format* is specified, this document format is set in the handle; in this case, the handle is returned instead of the format setting.

INIT_TEXT_HANDLE

The INIT_TEXT_HANDLE function returns a partially initialized handle that contains preset values for the text's format or language. It can be inserted into a handle column. This is useful when you add a row containing text whose format and language are not the same as those specified in the text configuration settings.

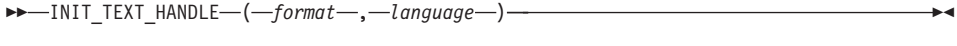
The returned handle is a value of type DB2TEXTH.

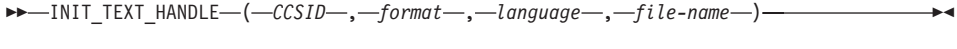
If you intend to search in text that is stored in *external files* rather than in a DB2 UDB for OS/390 table, you can use the INIT_TEXT_HANDLE function to return a completely initialized handle that contains preset values for the text's CCSID, format, language, and the location of the file.

The returned handle is a value of type DB2TEXTFH.

Use the INIT_TEXT_HANDLE function to insert or update handle values.

Function syntax





Function parameters

format
A string of type VARCHAR(30) specifying the new document format setting. The formats supported are listed in "Formats" on page 235.

language
A string of type VARCHAR(30) specifying the new document language setting. The supported languages are listed in "Languages" on page 236.

file-name
A string of type VARCHAR(150) specifying the absolute path and file name of the external file that is to be associated with the handle. To have access to the file in UNIX, the DB2 UDB for OS/390 instance owner must be included in the file access permissions. For OS/2 and Windows users, the file access permissions must include the logon user IDs.

LANGUAGE

The LANGUAGE function does one of the following:

- Returns the document language specified in a handle
- Changes the language specification in a document's handle, and returns the changed handle.

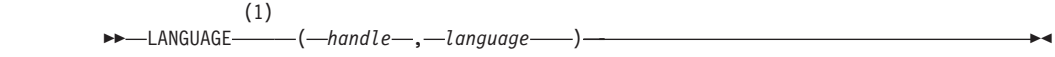
The returned document language is a string of type VARCHAR(30). The returned handle is of type DB2TEXTH or DB2TEXTFH.

This is the language parameter used for indexing the corresponding text document. The supported languages are listed in "Languages" on page 236.

Function syntax

Notes:

1 Returns a language value, type VARCHAR(30).



Notes:

1 Returns a handle, type DB2TEXTH or DB2TEXTFH.

Function parameters

handle
An expression whose result is a value of type DB2TEXTH or DB2TEXTFH. It is usually the name of a handle column from which the language setting is to be returned or set.

language
The new document language setting of data type VARCHAR(30).

If *language* is specified, this document language is set in the handle; the handle is returned instead of the language setting.

NO_OF_MATCHES

NO_OF_MATCHES can search in text documents and return an INTEGER value indicating how many matches resulted per document.

Function syntax

Function parameters

handle
An expression whose result is a value of type DB2TEXTH or DB2TEXTFH. It is usually the name of a handle column containing the handles of the text documents to be searched.

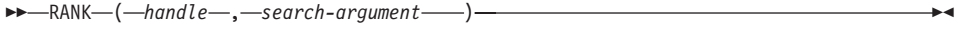
search-argument
A string of type LONG VARCHAR containing the terms to be searched for. See "Chapter 10. Syntax of search arguments" on page 173.

RANK

RANK can search in text documents and return a rank value for each document found, indicating how well the found document is described by the search argument.

RANK returns an DOUBLE value between 0 and 1. The rank value is absolute, indicating how well the found document satisfies the search criteria in relation to other found documents. The value indicates the number of matches found in the document in relation to the document's size.

Function syntax



Function parameters

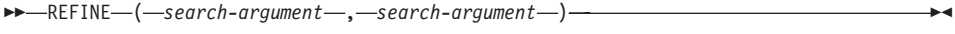
handle
An expression whose result is a value of type DB2TEXTH or DB2TEXTFH. It is usually the name of a handle column containing the handles of the text documents to be searched.

search-argument
A string of type LONG VARCHAR containing the terms to be searched for. See "Chapter 10. Syntax of search arguments" on page 173.

REFINE

The REFINE function takes two search arguments and returns a combined search argument of type LONG VARCHAR, consisting of the two original search arguments connected by the Boolean operator AND.

Function syntax



Function parameters

search-argument

A string of type LONG VARCHAR containing the terms to be searched for. See "Chapter 10. Syntax of search arguments" on page 173.

The search argument must not contain the search parameters IS ABOUT, THESAURUS, or EXPAND.

SEARCH_RESULT

The SEARCH_RESULT function returns the result of a search in an intermediate table. This UDF can be used in a FROM clause of an SQL statement.

The returned table has the following structure:

```
Column Name         Datatype

HANDLE              DB2TX.DB2TEXTH, DB2TX.DB2TEXTFH
NUMBER_OF_MATCHES   INTEGER
RANK                DOUBLE
```

Values are generated only for the selected columns of the intermediate table. Select count(*) generates the HANDLE column only. Because the calculation of the rank values consumes a lot of system resources, you should not select the rank value from the intermediate table if the rank value is not required.

This UDF is faster than CONTAINS or RANK when processing large tables.

Function syntax

Function parameters

handle
An expression whose result is a value of type DB2TEXTH or DB2TEXTFH. It is usually the name of a handle column containing the handles of the text documents to be searched.

search-argument
A string of type LONG VARCHAR containing the terms to be searched for. See “Chapter 10. Syntax of search arguments” on page 173.

Examples

For an example, refer to “Improving search performance” on page 94, or look at the sample UDFs provided in the file described in “The sample UDFs” on page 75.

Chapter 10. Syntax of search arguments

A search argument is the condition that you specify when searching for terms in text documents. It consists of one or several search terms and search parameters.

Examples of search arguments are given in "Specifying search arguments" on page 82, and in a file called `txsample.udf`. It contains examples of Text Extender UDFs that run against the sample table described in "The sample table DB2TX.SAMPLE" on page 76.

The UDFs that use search arguments are:

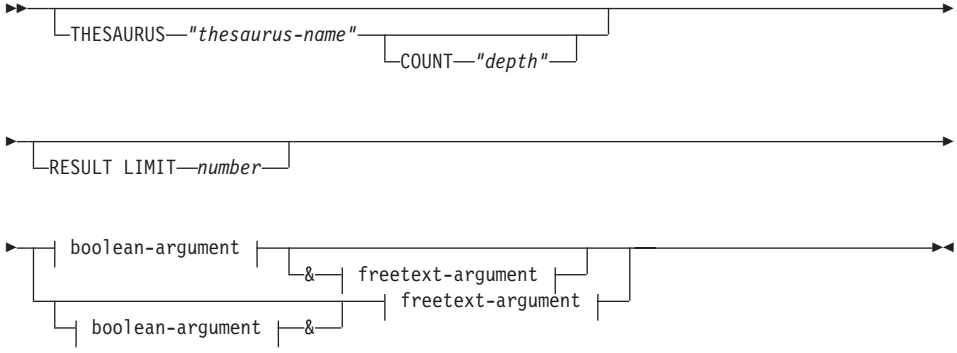
- CONTAINS. This function uses a search argument to search for text in a particular text document. It returns the INTEGER value 1 if the document contains the text. Otherwise, it returns 0.
- NO_OF_MATCHES. This function uses a search argument to search in text documents. It returns an INTEGER value indicating how many matches resulted per document.
- RANK. This function uses a search argument to search in text documents. It returns a value for each document found, indicating how well the found document is described by the search argument.
- REFINE. This function takes two search arguments and returns a combined search argument of type LONG VARCHAR, consisting of the two original search arguments connected by the Boolean operator AND.
- SEARCH_RESULT. This function returns a table containing the requested information, that is, the rank, number of matches, and the handle.

The API functions that use search arguments are:

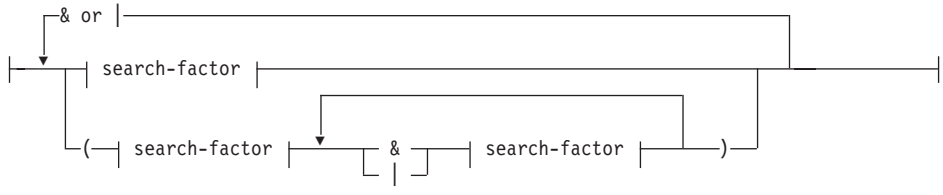
- DesGetBrowseInfo. This function uses a search argument for searching through text identified by a handle. It returns a pointer to browse information needed by DesStartBrowseSession for highlighting terms.
- DesGetSearchResultTable. This function uses a search argument for searching through text documents identified by a text column. The handle data of the found text items is written to a result table. Browse information about rank and the number of matches can also be written to the result table.

Search argument

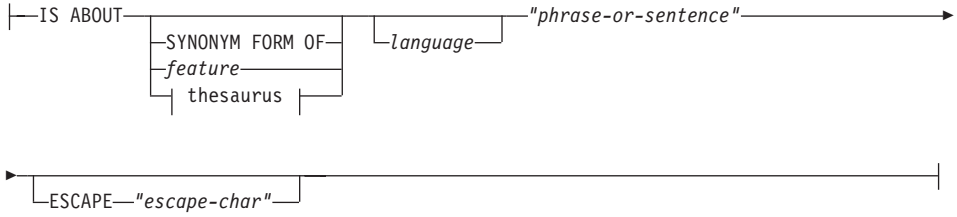
Search argument syntax



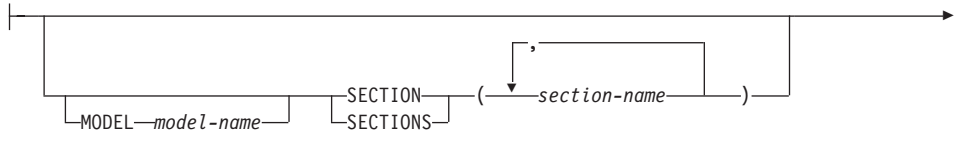
boolean-argument:



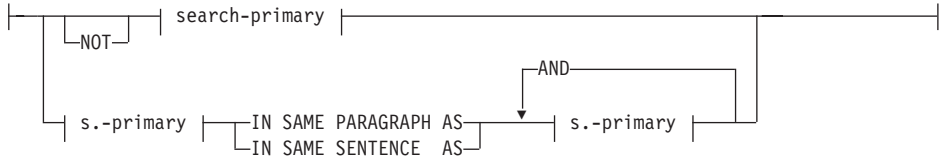
freetext-argument:



search-factor:

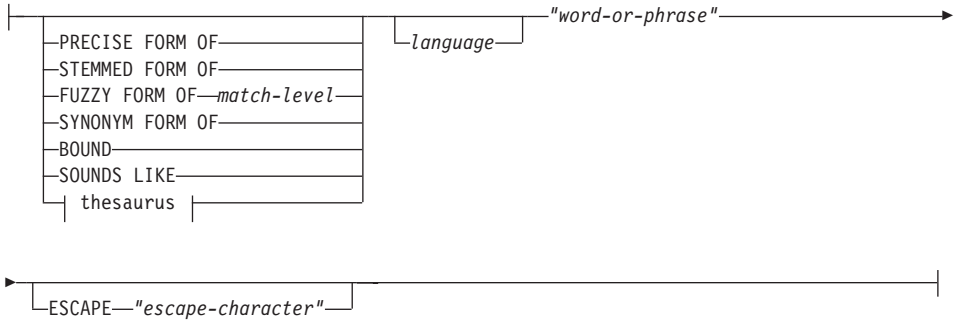


search-element:



search-primary:

search-atom:



thesaurus (if THESAURUS is specified):

Examples

Examples are given in “Specifying search arguments” on page 82.

Search parameters

IS ABOUT

An option that lets you specify a free-text search argument, that is, a natural-language phrase or sentence that describes the concept to be found. See "Free-text and hybrid search" on page 90.

MODEL *model-name*

A keyword used to specify the name of the document model to be used in the search term. The document model describes the structure of documents that contain identifyable sections so that the content of these sections can be searched individually.

The model name must be specified in a document model file described in "Working with structured documents" on page 54. The model name can be masked using wildcard characters.

If you do not specify a model, the default model specified during index creation is used.

SECTION(S) *section-name*

A keyword used to specify one or more sections that the search is to be restricted to. The section name must be specified in a model in a document model file, described in "Working with structured documents" on page 54. A section name can be masked using wildcard characters % and _.

Restrictions: Searching in nested sections is possible only for documents stored in columns enabled with format XML. For Ngram indexes, only one section name can be searched and XML format is not supported.

THESAURUS *thesaurus-name*

A keyword used to specify the name of the thesaurus to be used to expand the search term. The thesaurus name is the file name (without its extension) of a thesaurus that has been compiled using the thesaurus compiler TXTHESC or TXTHESN. There are default thesauri `desthes` and `desnthes`, stored in the sample directory, where `desnthes` is an Ngram thesaurus. You can also specify the file's path name. The default path name is the dictionary path.

COUNT *depth*

A keyword used to specify the number of levels (the depth) of terms in the thesaurus that are to be used to expand the search term for the given relation. If you do not specify this keyword, a count of 1 is assumed.

RESULT LIMIT *number*

A keyword used to specify the maximum number of entries to be returned in the result list. *number* is a value from 1 to 32767. If a free-text search is used, the search result list is ranked only with respect to the complete search result list. Otherwise, the limited search result is ranked only from the entries of the list.

EXPAND *relation*

A keyword used to specify the relation, such as INSTANCE, between the search term specified in TERM OF and the thesaurus terms to be used to expand the search term. The relation name must correspond to a relation used in the thesaurus. See "Thesaurus concepts" on page 27.

TERM OF *"word-or-phrase"*

The search term, or multi-word search term, to which other search terms are to be added from the thesaurus.

search-factor

An operand that can be combined with other operands to form a search argument. The evaluation order is from left to right. The logical AND (&) operator binds stronger than the logical OR (|) operator. Example:

```
"passenger" & "vehicle" | "transport" & "public"
```

is evaluated as:

```
("passenger" & "vehicle") | ("transport" & "public")
```

To search for:

```
"passenger" & ("vehicle" | "transport") & "public"
```

you must include the parentheses as shown.

NOT search-primary

An operator that lets you exclude text documents from your search that contain a particular term.

When NOT is used in a search factor, you cannot use the SYNONYM FORM OF keyword.

search-primary IN SAME PARAGRAPH AS search-primary

A keyword that lets you search for a combination of terms occurring in the same paragraph.

The following search argument finds text documents containing the term "traffic" only if the term "air" is in the same paragraph.

```
"traffic" IN SAME PARAGRAPH AS "air"
```

You cannot use the IN SAME PARAGRAPH AS keyword when NOT is used in a search factor.

search-primary IN SAME SENTENCE AS search-primary
A keyword that lets you search for a combination of terms occurring in the same sentence. Similar to IN SAME PARAGRAPH AS.

AND search-primary
A keyword that lets you combine several search-primaries to be searched for in the same sentence or the same paragraph.

The following search argument searches for “forest”, “rain”, “erosion”, and “land” in the same sentence.

```
"forest" IN SAME SENTENCE AS "rain" AND "erosion" AND "land"
```

search-atom
If you connect a series of search atoms by commas, then a search is successful if a term in any one of the search atoms is found. Each search atom must contain at least a word or a phrase.

The following statement is true if one or more of the search arguments is found.

```
CONTAINS (mytexthandle, '( "text",
                           "graphic",
                           "audio",
                           "video")') = 1
```

PRECISE FORM OF, STEMMED FORM OF, FUZZY FORM OF, SYNONYM FORM OF, BOUND
Table 6 shows the options that correspond to the various types of index. For example, for a linguistic index, any of the options are suitable except for PRECISE FORM OF. If you specify PRECISE FORM OF, it is ignored and the default value is taken.

The search term processing is described in more detail in Table 7 on page 179.

Table 6. Linguistic options

Search atom keyword	Index type					
	Linguistic	Precise	Precise Normalized	Dual	Ngram	Ngram case-enabled
PRECISE FORM OF		X	X	X		O
STEMMED FORM OF	X			O	O	O
FUZZY FORM OF					O	O
IS ABOUT	O	O	O	O		
SYNONYM FORM OF	O	O	O	O		

Table 6. Linguistic options (continued)

EXPAND	O	O	O	O		
SOUNDS LIKE	O	O	O	O		
IN SAME SENTENCE AS	O	O	O	O	O	O
IN SAME PARAGRAPH AS	O	O	O	O	O	O
BOUND					O	O
X=default setting O=function available						

Table 7. Search term options for Ngram indexes

	Search term processing				
	Case		Stemming	Match	
Search atom keyword	Sensitive	Insensitive		Exact	Fuzzy
PRECISE FORM OF	when case-enabled	X		X	
STEMMED FORM OF		X	X		
FUZZY FORM OF		X			X
X=default setting					

If you use a keyword that is not available for that index type, it is ignored and either the default keyword is used instead, or a message is returned.

PRECISE FORM OF

A keyword that causes the word (or each word in the phrase) following PRECISE FORM OF to be searched for exactly as typed, rather than being first reduced to its stem form. For precise and dual indexes, this form of search is case-sensitive; that is, the use of upper- and lowercase letters is significant. For example, if you search for `mouse` you do not find "Mouse".

This is the default option for precise and dual indexes. For a precise normalized index, the default form of search is not case-sensitive. If you specify this keyword for a linguistic index, it is ignored and STEMMED FORM OF is assumed.

STEMMED FORM OF

A keyword that causes the word (or each word in the phrase) following STEMMED FORM OF to be reduced to its word

stem before the search is carried out. This form of search is not case-sensitive. For example, if you search for `mouse` you find "Mouse".

The way in which words are reduced to their stem form is language-dependent.

Example: `programming computer systems` is replaced by `program compute system` when you use the US-English dictionary, and by `programme compute system` when you use the UK-English dictionary.

This search phrase can find "programmer computes system", "program computing systems", "programming computer system", and so on.

This is the default option for linguistic indexes. If you specify this keyword for a precise index, it is ignored and PRECISE FORM OF is assumed instead.

FUZZY FORM OF

A keyword for making a "fuzzy" search, which is a search for terms that have a similar spelling to the search term. This is particularly useful when searching in documents that were created by an Optical Character Recognition (OCR) program. Such documents often include misspelled words. For example, the word `economy` could be recognized by an OCR program as `econony`.

match-level: An integer from 1 to 5 specifying the degree of similarity, where 5 is more similar than 1.

SYNONYM FORM OF

A keyword that causes the word or phrase following SYNONYM FORM OF to be searched for together with its synonyms. The synonyms are provided by the dictionary specified by *language* or else by the default dictionary.

Synonyms for a phrase are alternative phrases containing all the possible combinations of synonyms that can be obtained by replacing each word of the original phrase by one of its synonyms. The word sequence remains as in the original phrase.

If you specify this keyword for a precise index, it is ignored and PRECISE FORM OF is assumed instead.

If you specify this keyword for a dual index, the search is made using the linguistic part of the dual index rather than the precise part.

You cannot specify this keyword when NOT is used in the search factor, or when the word or phrase to be searched for contains masking characters.

BOUND
A keyword for searching in documents that use the Korean CCSID. It causes the search to respect word phrase boundaries. If *language* is specified, it is ignored; Korean is assumed.

language
A variable that determines which dictionary is used in linguistic processing of text documents during indexing and retrieval. This applies not only to linguistic and dual indexes, but also to precise indexes because these use a dictionary to process stop words.

Linguistic processing includes synonym processing and word-stem processing. See "The supported languages" on page 25 for more information.

The supported languages are listed in "Languages" on page 236.

Note: When searching in documents that are not in U.S. English, you must specify the language in the search argument *regardless of the default language*.

"word-or-phrase"
A word or phrase to be searched for. The characters that can be used within a word are language-dependent. It is also language-dependent whether words need to be separated by separator characters. For English and most other languages, each word in a phrase must be separated by a blank character.

Precise or linguistic search. Text Extender can search using either the precise form of the word or phrase, or a variation of it. If you do not specify one of the options in Table 6 on page 178, the default linguistic options are used according to which type of index is being used.

To search for a character string that contains double quotation marks, type the double quotation marks twice. For example, to search for the text `"wildcard" character`, use:

```
"""wildcard"" character"
```

Masking characters. A word can contain the following masking characters:

_ (underscore)
Represents any single character.

% (percent)
Represents any number of arbitrary characters. If a word consists of a single %, then it represents an optional word of any length.

A word cannot be composed exclusively of masking characters, except when a single % is used to represent an optional word.

If you use a masking character, you cannot use SYNONYM FORM OF, *feature*, or THESAURUS.

ESCAPE *escape-character*
A character that identifies the next character as one to be searched for and not as one to be used as a masking character.

Example: If *escape-character* is $, then $%, $_, and $$ represent %, _, and $ respectively. Any % and _ characters not preceded by $ represent masking characters.

Summary of rules and restrictions:

Boolean operations
NOT is not allowed after OR.

Dual index
Takes as default STEMMED FORM OF. If masking characters are used, searches are case-sensitive.

FUZZY FORM OF
The first 3 characters must match. Cannot be used if a word in the search atom contains a masking character. Cannot be used in combination with NOT. Can be used only with an Ngram index.

IN SAME PARAGRAPH AS
Cannot be used if NOT is used in a search factor.

IN SAME SENTENCE AS
Cannot be used if NOT is used in a search factor.

Linguistic index
Prevents the use of PRECISE FORM OF. Takes as default STEMMED FORM OF. Masking characters can be used. Searches are case-insensitive.

Masking character
Prevents the use of SYNONYM FORM OF, *feature*, and THESAURUS.

Ngram index
Masking characters can be used, although not following a non-alphanumeric character. Searches are case-insensitive unless the index is case-enabled and PRECISE FORM OF is used.

NOT Prevents the use of SYNONYM FORM OF, IN SAME PARAGRAPH AS, and IN SAME SENTENCE AS.

PRECISE FORM OF
Ignored for a linguistic index.

Precise index
Prevents the use of STEMMED FORM OF, and SYNONYM FORM OF. Takes as default PRECISE FORM OF. Masking characters can be used. Searches are case-sensitive.

STEMMED FORM OF
Ignored for a precise index, but available for a normalized precise index containing English documents.

SYNONYM FORM OF
Cannot be used if a word in the search atom contains a masking character. Cannot be used in combination with NOT. Cannot be used with a precise index.

Chapter 11. API functions for searching and browsing

Text Extender provides C functions for searching for text documents, and for browsing (displaying) the found documents. These functions constitute the Text Extender application programming interface (API). This chapter describes the API functions in alphabetical order.

"Chapter 6. Using the API functions for searching and browsing" on page 97 provides an introduction to the functions, and describes how they can be used together.

Function	Purpose	Page
DesCloseDocument	Releases the storage allocated by DesOpenDocument.	187
DesEndBrowseSession	Closes a browse session and releases the storage allocated by DesStartBrowseSession.	188
DesFreeBrowseInfo	Releases the storage allocated by DesGetBrowseInfo.	189
DesGetBrowseInfo	Searches in the document for text using a search argument, and creates browse information.	190
DesGetMatches	Returns a pointer to highlighting information for the text document described by a document handle. The highlighting information is a data stream. It comprises the text context (at least one paragraph) and information for highlighting text in that context.	193
DesGetSearchResultTable	Takes a search argument to search for text documents in a given text column, and stores the result in a user-provided table. It can also return browse information.	198
DesOpenDocument	Receives a browse session pointer, a handle, and an option DES_FAST or DES_EXTENDED indicating the type of linguistic processing to be used for highlighting found terms. Prepares the text document that corresponds to the handle to get the document text and highlighting information, and returns a document handle that is used for iteratively calling DesGetMatches.	203
DesStartBrowseSession	Opens a browse session using the browse information from DesGetBrowseInfo, and returns a browse session handle for use by the other browse functions.	206

Tip

Many of the API functions need a connection handle (hdbc). You must provide this handle using the SQLConnect function, but this does not prevent you from calling Text Extender from embedded SQL programs. The *DB2 Call Level Interface Guide and Reference* describes how to mix CLI statements with embedded SQL statements.

DesCloseDocument

Purpose

Closes a text document opened by DesOpenDocument, and releases the storage allocated during the return of document text and highlighting information.

Syntax

```
DESRETURN
  DesCloseDocument
     (DESBROWSESESSION     BrowseSession,
      DESHANDLE            DocumentHandle);
```

Function arguments

Table 8. DesCloseDocument arguments

Data Type	Argument	Use	Description
DESBROWSESESSION	*BrowseSession*	input	Browse session handle.
DESHANDLE	*DocumentHandle*	input	Handle returned by DesOpenDocument identifying an opened text document.

Return codes

RC_SUCCESS

RC_INVALID_PARAMETER
RC_INVALID_SESSION
RC_SE_INCORRECT_HANDLE
RC_SE_IO_PROBLEM
RC_SE_LS_FUNCTION_FAILED
RC_SE_NOT_ENOUGH_MEMORY
RC_SE_REQUEST_IN_PROGRESS
RC_SE_WRITE_TO_DISK_ERROR

Restrictions

This function can be called only after you have opened a text document by calling DesOpenDocument.

DesEndBrowseSession

Purpose

Ends a browse session started by DesStartBrowseSession and releases the storage allocated for the browse session.

Syntax

```
DESRETURN
  DesEndBrowseSession
     (DESBROWSESESSION     BrowseSession);
```

Function arguments

Table 9. DesEndBrowseSession arguments

Data Type	Argument	Use	Description
DESBROWSESESSION	*BrowseSession*	input	Browse session handle.

Usage

This function does not release the storage allocated for the browse session by DesGetBrowseInfo. This storage contains browse information that can still be used for another browse session. To release this storage, call DesFreeBrowseInfo.

Return codes

RC_SUCCESS

RC_INVALID_SESSION
RC_INVALID_PARAMETER
RC_SE_UNEXPECTED_ERROR

Restrictions

This function can be called only after you have started a browse session by calling DesStartBrowseSession.

DesFreeBrowseInfo

Purpose

Frees the storage allocated for the browse information by DesGetBrowseInfo.

Syntax

```
DESRETURN
  DesFreeBrowseInfo
     (DESBROWSEINFO        BrowseInfo);
```

Function arguments

Table 10. DesFreeBrowseInfo arguments

Data Type	Argument	Use	Description
DESBROWSEINFO	*BrowseInfo*	input	Browse information

Return codes

RC_SUCCESS

RC_INVALID_PARAMETER

Restrictions

This function can be called only after you have allocated storage for browsing information by calling DesGetBrowseInfo.

DesGetBrowseInfo

Purpose

Receives a search argument for searching through text identified by a handle. It returns a pointer to browse information needed by DesStartBrowseSession for highlighting the found terms.

Syntax

```
DESRETURN
  DesGetBrowseInfo
   (SQLHDBC              hdbc,
    SQLCHAR              *pHandle,
    DESUSHORT            HandleLength,
    char                 *pSearchArgument,
    DESSMALLINT          ArgumentLength,
    DESBROWSEINFO        *pBrowseInfo,
    DESMESSAGE           *pErrorMessage);
```

Function arguments

Table 11. DesGetBrowseInfo arguments

Data Type	Argument	Use	Description
SQLHDBC	*hdbc*	input	A database connection handle.
SQLCHAR *	*pHandle*	input	Pointer to a handle that has been extracted from the database.
DESUSHORT	*HandleLength*	input	Length of pHandle. DES_NTS cannot be used here.
char *	*pSearchArgument*	input	Pointer to the text search argument that specifies the information that you want to find.
DESSMALLINT	*ArgumentLength*	input	Either the length of pSearchArgument (not including a null byte terminator), or DES_NTS.
DESBROWSEINFO *	*pBrowseInfo*	output	Pointer to browse information containing the data needed to browse a text document. This pointer is passed to DesStartBrowseSession.
DESMESSAGE *	*pErrorMessage*	output	Implementation-defined message text. If an error occurs, Text Extender returns an error code and an error message. The application program allocates the buffer of size DES_MAX_MESSAGE_LENGTH. If *pErrorMessage* is the null pointer, no error message is returned.

Usage

Your application program must establish a connection to the database before it calls DesGetBrowseInfo.

For the pointer to the search argument, *char** is used rather than *SQLCHAR**. This is because it is possible that the parameter value may not come from the database.

For the mapping between the SQL data types and C data types, you must use the SQL symbolic name SQL_VARBINARY for a handle. The type of host variables pointing to the C representation of *Handle* values is SQLCHAR*.

Text Extender allocates storage for the browse information. The application program must free the storage and related resources by calling DesFreeBrowseInfo.

Because *Handle* values are bit data and contain several '\0' characters, you must specify the length of *pHandle*.

The search argument in pSearchArgument is described in "Chapter 10. Syntax of search arguments" on page 173.

Return codes

RC_SUCCESS
RC_NO_BROWSE_INFO

RC_ALLOCATION_ERROR
RC_FILE_IO_PROBLEM
RC_INTERNAL_ERROR
RC_INVALID_PARAMETER
RC_PARSER_INVALID_ESCAPE_CHARACTER
RC_PARSER_INVALID_USE_OF_ESCAPE_CHAR
RC_PARSER_SYNTAX_ERROR
RC_SE_COMMUNICATION_PROBLEM
RC_SE_EMPTY_INDEX
RC_SE_EMPTY_QUERY
RC_SE_FUNCTION_DISABLED
RC_SE_FUNCTION_IN_ERROR
RC_SE_INCORRECT_HANDLE
RC_SE_INDEX_DELETED

RC_SE_INDEX_NOT_ACCESSIBLE
RC_SE_INDEX_SUSPENDED
RC_SE_INSTALLATION_PROBLEM
RC_SE_IO_PROBLEM
RC_SE_MAX_NUMBER_OF_BUSY_INDEXES
RC_SE_MAX_OUTPUT_SIZE_EXCEEDED
RC_SE_NOT_ENOUGH_MEMORY
RC_SE_PROCESSING_LIMIT_EXCEEDED
RC_SE_QUERY_TOO_COMPLEX
RC_SE_SERVER_BUSY
RC_SE_SERVER_CONNECTION_LOST
RC_SE_SERVER_NOT_AVAILABLE
RC_SE_UNEXPECTED_ERROR
RC_SE_UNKNOWN_INDEX_NAME
RC_SE_UNKNOWN_SERVER_NAME
RC_SE_WRITE_TO_DISK_ERROR

Warnings: The following return codes indicate that the function has returned a result, but it may not be as expected.

RC_SE_CONFLICT_WITH_INDEX_TYPE
RC_SE_DICTIONARY_NOT_FOUND
RC_SE_STOPWORD_IGNORED
RC_SE_UNKNOWN_SECTION_NAME
RC_SE_DOCMOD_READ_PROBLEM

Restrictions

This function can be called only after you have made a connection to a database and used a Text Extender UDF to extract a handle from the database.

DesGetMatches

Purpose

Returns a data stream containing highlighting information for the text document described by a document handle. See "Data stream syntax" on page 194. The highlight information comprises the text context (at least one paragraph) and information for highlighting text in that context.

DesGetMatches returns only a portion of the data stream, indicating the length of the portion in the output structure.

A sequence of calls to DesGetMatches gets the entire text document content. When the end of the text document is reached, RC_SE_END_OF_INFORMATION is returned.

Syntax

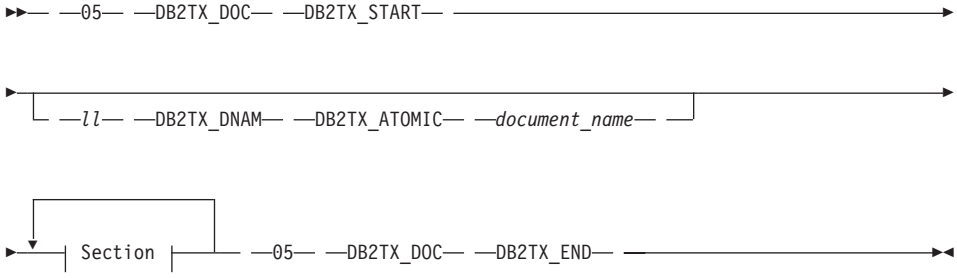
```
DESRETURN
  DesGetMatches
     (DESBROWSESESSION    BrowseSession,
      DESHANDLE           DocumentHandle,
      DESMATCHINFO        *pMatchInfo,
      DESULONG            *pMatchInfoLength,
      DESMESSAGE          *pErrorMessage);
```

Function arguments

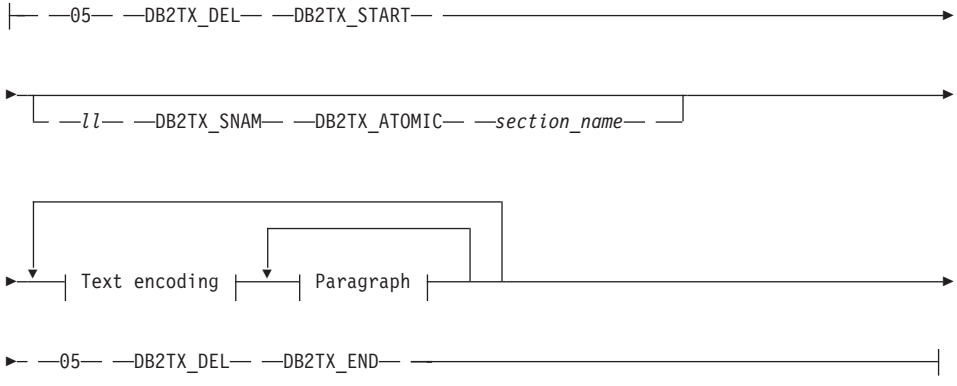
Table 12. DesGetMatches arguments

Data Type	Argument	Use	Description
DESBROWSESESSION	*BrowseSession*	input	Browse session handle.
DESHANDLE	*DocumentHandle*	input	Document handle returned by DesOpenDocument.
DESMATCHINFO *	*pMatchInfo*	output	Pointer to a buffer containing the data stream portion received. DesGetMatches allocates that buffer.
DESULONG *	*pMatchInfoLength*	output	The length of the data stream portion pointed to by pMatchInfo.
DESMESSAGE *	*pErrorMessage*	output	Implementation-defined message text. If an error occurs, Text Extender returns an error code and an error message. The application program allocates the buffer of size DES_MAX_MESSAGE_LENGTH. If *pErrorMessage* is the null pointer, no error message is returned.

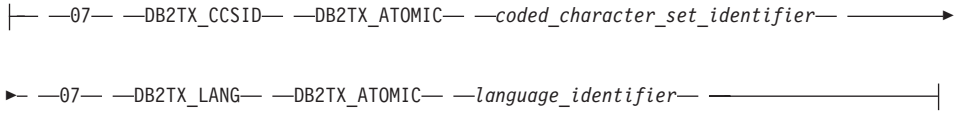
Data stream syntax



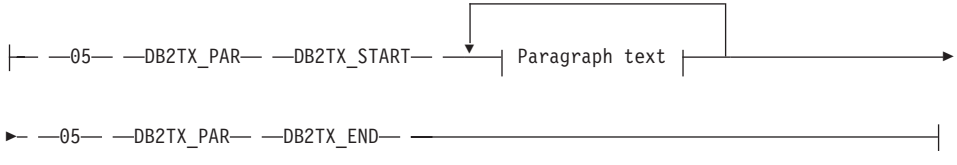
Section:



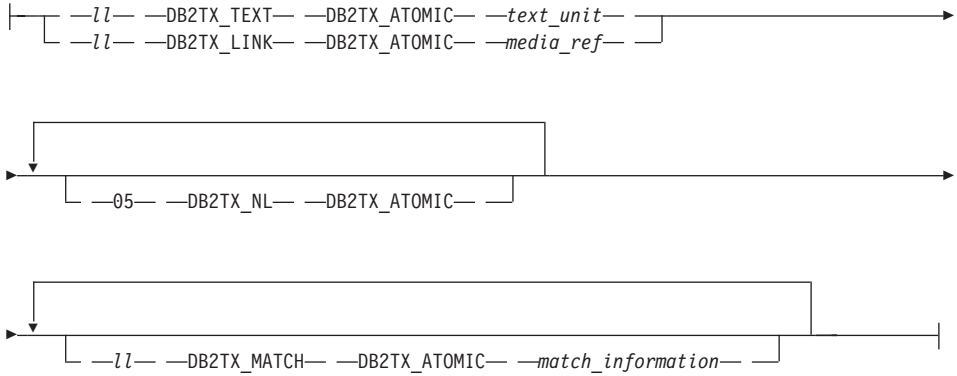
Text encoding:



Paragraph:



Paragraph text:



Each segment in the syntax diagram, such as `05 DB2TX_DOC DB2TX_START` begins with a length field of type integer, which in the diagram is either an explicit number, such as `05`, or a variable *ll*. The length of the segment includes the 2-byte length field.

Note: The length is in big-endian format.

Each segment includes one of the following 1-byte type identifiers:

DB2TX_START
Indicates the start of a segment, such as a document or a paragraph.

DB2TX_END
Indicates the end of a segment.

DB2TX_ATOMIC
Indicates that the item that follows is atomic, such as a document name or a language identifier.

The data stream items are each two bytes long. They are:

DB2TX_DOC
Indicates the start and end of a document.

DB2TX_DNAM
A document name. If no name is specified, the identifier of the document is used.

DB2TX_DEL
Indicates the start and end of a document element. The only type of document element currently supported is a *text section*.

DB2TX_SNAM
Specifies the name of a text section. Currently Text Extender supports only one text section and automatically supplies a default name. If you specify a section name, it is ignored.

DB2TX_PAR
Indicates the start and end of a text paragraph within the current section.

DB2TX_TEXT
Specifies one text portion within the current paragraph. Usually, *text unit* contains one line of text, and the TEXT item is followed by a DB2TX_NL item; but text lines may also be split into several parts, each part specified in its own DB2TX_TEXT item.

The text uses the CCSID and language associated with the current paragraph.

DB2TX_LINK
Specifies a Text Extender hypermedia reference. It uses the CCSID of the current paragraph.

DB2TX_NL
Indicates the start of a new line in the current paragraph.

DB2TX_MATCH
Contains occurrence information for matches in the current text portion. The information is supplied as a sequence of binary number pairs. The first number in each pair is the offset of a match within the current text portion, the second number is the length, in characters, of that match. The given length could exceed the given text portion. Both offset and length are two-byte values specified in big-endian format.

DB2TX_CCSID
The CCSID for text in subsequent paragraphs until a paragraph is preceded by a new DB2TX_CCSID item. The following CCSIDs are returned:

DB2TX_CCSID_00500
for text in the Latin-1 EBCDIC codepage 500.

DB2TX_CCSID_04946
for text in the Latin-1 ASCII codepage 850.

DB2TX_CCSID_00819
for text in the ASCII codepage 819.

These symbolic names for CCSIDs are defined in the file DES_EXT.H provided with the Text Extender. The two-byte binary values are specified in big-endian format.

DB2TX_LANG
The language identifier for text in subsequent paragraphs until a paragraph is preceded by a new DB2TX_LANG item. File DES_EXT.H provided with Text Extender defines symbolic names for all language identifiers supported by Text Extender. The two-byte binary values are specified in big-endian format.

Usage

DesGetMatches returns RC_SE_END_OF_INFORMATION when the end of the text document is reached.

Return codes

RC_SUCCESS
RC_SE_END_OF_INFORMATION

RC_INVALID_PARAMETER
RC_INVALID_SESSION
RC_SE_CAPACITY_LIMIT_EXCEEDED
RC_SE_INCORRECT_HANDLE
RC_SE_IO_PROBLEM
RC_SE_NOT_ENOUGH_MEMORY
RC_SE_REQUEST_IN_PROGRESS
RC_SE_LS_FUNCTION_FAILED
RC_SE_UNEXPECTED_ERROR

Warnings: The following return codes indicate that the function has returned a result, but it may not be as expected.

RC_SE_DICTIONARY_NOT_FOUND

Restrictions

This function can be called only after you have opened a text document by calling DesOpenDocument.

DesGetSearchResultTable

Purpose

Uses a search argument for searching through text documents identified by a text column. The handle data of the found text items is written to a result table. Browse information about rank and the number of matches can also be written to the result table.

Syntax

```
DESRETURN
  DesGetSearchResultTable
    (SQLHDBC           hdbc,
     char              *pTableSchema,
     DESSMALLINT       TableSchemaLength,
     char              *pTableName,
     DESSMALLINT       TableNameLength,
     char              *pColumnName,
     DESSMALLINT       ColumnNameLength,
     char              *pSearchArgument,
     DESSMALLINT       ArgumentLength,
     char              *pResultSchema,
     DESSMALLINT       ResultSchemaLength,
     char              *pResultTableName,
     DESSMALLINT       ResultTableNameLength,
     DESSEARCHOPTION   SearchOption,
     DESBROWSEOPTION   BrowseOption,
     DESBROWSEINFO     *pBrowseInfo,
     DESMESSAGE        *pErrorMessage);
```

Function arguments

Table 13. DesGetSearchResultTable arguments

Data Type	Argument	Use	Description
SQLHDBC	hdbc	input	A database connection handle.
char *	pTableSchema	input	The schema of the base table to be searched.
DESSMALLINT	TableSchemaLength	input	Either the length of pTableSchema (not including a null byte terminator) or DES_NTS.
char *	pTableName	input	Pointer to the name of the base table to be searched.
DESSMALLINT	TableNameLength	input	Either the length of pTableName (not including a null byte terminator) or DES_NTS.

Table 13. DesGetSearchResultTable arguments (continued)

Data Type	Argument	Use	Description
char *	pColumnName	input	Pointer to the name of the column to be addressed by the intended text search. The column must be of type DESTEXTH.
DESSMALLINT	ColumnNameLength	input	Either the length of pColumnName (not including a null byte terminator) or DES_NTS.
char *	pSearchArgument	input	Pointer to the text search argument.
DESSMALLINT	ArgumentLength	input	Either the length of pSearchArgument (not including a null byte terminator) or DES_NTS.
char *	pResultSchema	input	Pointer to the schema containing the result table.
DESSMALLINT	ResultSchemaLength	input	Either the length of pSchemaName (not including a null byte terminator) or DES_NTS.
char *	pResultTableName	input	Pointer to the name of the result table that you have previously created in which the result of the search is to be stored. See Figure 15 on page 200 for the structure of this table.
DESSMALLINT	ResultTableNameLength	input	Either the length of pResultTableName (not including a null byte terminator) or DES_NTS.
DESSEARCHOPTION	SearchOption	input	An option that determines whether you are asking for ranking information, for the number of matches, or only for the handles of the matching text documents. DES_RANK DES_MATCH DES_RANKANDMATCH DES_TEXTHANDLEONLY This option determines the content of result table as described in "Usage" on page 200.
DESBROWSEOPTION	BrowseOption	input	Reserved.
DESBROWSEINFO *	pBrowseInfo	output	Pointer to browse information or a pointer to null, depending on the value of BrowseOption.

Table 13. DesGetSearchResultTable arguments (continued)

Data Type	Argument	Use	Description
DESMESSAGE *	*pErrorMessage*	output	Implementation-defined message text. If an error occurs, Text Extender returns an error code and an error message. The application program allocates the buffer of size DES_MAX_MESSAGE_LENGTH. If *pErrorMessage* is the null pointer, no error message is returned.

Usage

The connection to the database must be established by the application program calling DesGetSearchResultTable.

The name *pResultTableName* refers to a result table that you have created in advance. The utility DESRESTB in the sample directory creates a result table for text handles. After the call of this function, the result table contains information identifying text values matching the search argument. This is the structure of the result table:

RESULT TABLE

TEXTHANDLE	RANK	MATCHES

Figure 15. Structure of the result table

The data type of TEXTHANDLE is DB2TEXTH or DB2TEXTFH. The data type of RANK is DOUBLE. The data type of MATCHES is INTEGER.

The search argument at *pSearchArgument* is described in "Chapter 10. Syntax of search arguments" on page 173.

If the value of *BrowseOption* is *BROWSE*, Text Extender returns browse information from the Text Extender search engine located on the server. *pBrowseInfo* points to the browse information which is the input to DesStartBrowseSession. If the value of *BrowseOption* is *NO_BROWSE* *pBrowseInfo* points to null.

Return codes

RC_SUCCESS
RC_NO_BROWSE_INFO
RC_SE_NO_DATA

RC_ALLOCATION_ERROR
RC_FILE_IO_PROBLEM
RC_INTERNAL_ERROR
RC_INVALID_BROWSE_OPTION
RC_INVALID_PARAMETER
RC_INVALID_SEARCH_OPTION
RC_INVALID_SESSION
RC_PARSER_INVALID_ESCAPE_CHARACTER
RC_PARSER_SYNTAX_ERROR
RC_RESULT_TABLE_NOT_EXIST
RC_SE_COMMUNICATION_PROBLEM
RC_SE_EMPTY_INDEX
RC_SE_EMPTY_QUERY
RC_SE_FUNCTION_DISABLED
RC_SE_FUNCTION_IN_ERROR
RC_SE_INCORRECT_HANDLE
RC_SE_INDEX_DELETED
RC_SE_INDEX_NOT_ACCESSIBLE
RC_SE_INDEX_SUSPENDED
RC_SE_INSTALLATION_PROBLEM
RC_SE_IO_PROBLEM
RC_SE_MAX_NUMBER_OF_BUSY_INDEXES
RC_SE_NOT_ENOUGH_MEMORY
RC_SE_PROCESSING_LIMIT_EXCEEDED
RC_SE_QUERY_TOO_COMPLEX
RC_SE_SERVER_BUSY
RC_SE_SERVER_CONNECTION_LOST
RC_SE_SERVER_NOT_AVAILABLE
RC_SE_UNEXPECTED_ERROR
RC_SE_UNKNOWN_INDEX_NAME
RC_SE_UNKNOWN_SERVER_NAME
RC_SE_WRITE_TO_DISK_ERROR
RC_SQL_ERROR_NO_INFO
RC_SQL_ERROR_WITH_INFO
RC_TEXT_COLUMN_NOT_ENABLED

Warnings: The following return codes indicate that the function has returned a result, but it may not be as expected.

RC_SE_CONFLICT_WITH_INDEX_TYPE
RC_SE_DICTIONARY_NOT_FOUND
RC_SE_STOPWORD_IGNORED
RC_SE_UNKNOWN_SECTION_NAME
RC_SE_DOCMOD_READ_PROBLEM

DesOpenDocument

Purpose

Receives a browse session pointer, a handle, and an option (DES_EXTENDED or DES_FAST) indicating whether the text document should be analyzed with or without the use of a dictionary. It prepares the text document that corresponds to the handle to get the document text and highlighting information, and it returns a document handle that is used for iteratively calling DesGetMatches.

Syntax

```
DESRETURN
  DesOpenDocument
    (DESBROWSESESSION    BrowseSession,
     SQLCHAR             *pHandle,
     DESUSHORT           HandleLength,
     DESMATCHMODE        MatchMode,
     DESHANDLE           *pDocumentHandle,
     DESMESSAGE          *pErrorMessage);
```

Function arguments

Table 14. DesOpenDocument arguments

Data Type	Argument	Use	Description
DESBROWSESESSION	*BrowseSession*	input	Browse session handle.
SQLCHAR *	*pHandle*	input	Pointer to a handle extracted from the database.
DESUSHORT	HandleLength	input	Length of pHandle (DES_NTS cannot be used).
DESMATCHMODE	MatchMode	input	Mode to determine whether a dictionary is used for finding the highlighting information. **DES_FAST** Do not use a dictionary **DES_EXTENDED** Use a dictionary
DESHANDLE *	pDocumentHandle	output	A document handle for iteratively calling DesGetMatches.

Table 14. DesOpenDocument arguments (continued)

Data Type	Argument	Use	Description
DESMESSAGE *	*pErrorMessage*	output	Implementation-defined message text. If an error occurs, Text Extender returns an error code and an error message. The application program allocates the buffer of size DES_MAX_MESSAGE_LENGTH. If *pErrorMessage* is the null pointer, no error message is returned.

Usage

DES_FAST and DES_EXTENDED refer to the use of linguistic processing for finding which terms to highlight in the browsed text. See "Linguistic processing for browsing" on page 23 for more information. Specify DES_FAST to use basic text analysis, and DES_EXTENDED to use extended matching.

For the mapping between the SQL data types and C data types, you must use the SQL symbolic name SQL_VARBINARY for a handle. The type of host variables pointing to the C representation of *TextHandle* values is SQLCHAR*.

Text Extender allocates storage for the browse information. The application program must free this storage and related resources by calling DesFreeBrowseInfo.

Because *TextHandle* values are bit data and contain several '\0' characters, you must specify the length of *pHandle*.

The caller must have read access to the table containing the text document referred to by pHandle.

Return codes

RC_SUCCESS

RC_ALLOCATION_ERROR
RC_INTERNAL_ERROR
RC_INVALID_MATCH_OPTION
RC_INVALID_PARAMETER
RC_INVALID_SESSION
RC_SE_DOCUMENT_NOT_ACCESSIBLE
RC_SE_DOCUMENT_NOT_FOUND
RC_SE_INCORRECT_HANDLE

RC_SE_IO_PROBLEM
RC_SE_LS_FUNCTION_FAILED
RC_SE_LS_NOT_EXECUTABLE
RC_SE_MAX_NUMBER_OF_BUSY_INDEXES
RC_SE_NOT_ENOUGH_MEMORY
RC_SE_REQUEST_IN_PROGRESS
RC_SE_UNKNOWN_INDEX_NAME
RC_SE_UNEXPECTED_ERROR

Restrictions

This function can be called only after you have started a browse session by calling DesStartBrowseSession.

DesStartBrowseSession

Purpose

Starts a browse session, establishing the environment needed for browsing a text document and highlighting its matches. It receives a pointer to browse information, either from DesGetBrowseInfo or from DesGetSearchResultTable, and returns a browse session handle for use by the other browse functions.

Syntax

```
DESRETURN
  DesStartBrowseSession
     (DESBROWSEINFO        BrowseInfo,
      char                 *pUserId,
      DESSMALLINT           UserIdLength,
      char                 *pPassword,
      DESSMALLINT           PasswordLength,
      DESBROWSESESSION     *pBrowseSession,
      DESMESSAGE           *pErrorMessage);
```

Function arguments

Table 15. DesStartBrowseSession arguments

Data Type	Argument	Use	Description
DESBROWSEINFO	*BrowseInfo*	input	Pointer to information needed for browsing and highlighting matches in a text document. The pointer is returned by DesGetSearchResultTable or DesGetBrowseInfo.
char *	*pUserId*	input	User ID for the database
DESSMALLINT	*UserIdLength*	input	Length of the user ID for the database
char *	*pPassword*	input	Password for the database
DESSMALLINT	*PasswordLength*	input	Length of the password for the database
DESBROWSESESSION *	*pBrowseSession*	output	A handle for a browse session for use by other browse functions.
DESMESSAGE *	*pErrorMessage*	output	Implementation-defined message text. If an error occurs, Text Extender returns an error code and an error message. The application program allocates the buffer of size DES_MAX_MESSAGE_LENGTH. If *pErrorMessage* is the null pointer, no error message is returned.

Usage

This function opens a browse session for browsing text documents. You are prompted for your user ID and password to check your authorization to access the database.

You close the browse session by calling DesEndBrowseSession.

BrowseInfo depends on the search argument and on the base text column used for building the browse information.

Return codes

RC_SUCCESS

RC_ALLOCATION_ERROR
RC_INVALID_BROWSE_INFO
RC_INVALID_PARAMETER
RC_INTERNAL_ERROR
RC_SE_NOT_ENOUGH_MEMORY
RC_SE_UNEXPECTED_ERROR
RC_SQL_ERROR_NO_INFO
RC_SQL_ERROR_WITH_INFO

Restrictions

You must call DesGetBrowseInfo or DesGetSearchResultTable with the appropriate Browse Option before calling this function.

Chapter 12. Return codes

This chapter lists the codes that are returned by the Text Extender API in response to a function call. They are listed in alphabetic order.

All Text Extender API calls return a numeric return code as the C function value. The return codes are defined in the include file DES_EXT.H provided with Text Extender.

The Text Extender API intercepts error situations and reports error conditions with a return code.

Applications that call Text Extender API functions should always check the return code before trying to process any other output parameters. The return codes possible with each call are listed with their parameters in "Chapter 11. API functions for searching and browsing" on page 185.

In some cases, incorrect input such as an obsolete session pointer can cause an abnormal end condition in the API services that cannot be intercepted by Text Extender.

RC_ALLOCATION_ERROR

Explanation: Cannot allocate storage for internal use.

What to do: Ensure that there is sufficient memory available.

RC_FILE_IO_PROBLEM

Explanation: Text Extender could not read or write a file.

What to do: Check that there is sufficient disk space and memory available at the server. Check that the environment variables and the text configuration settings are set correct.

RC_INVALID_BROWSE_INFO

Explanation: The browse information returned by DesGetSearchResultTable or by DesGetBrowseInfo and used as input for DesStartBrowseSession is not valid.

What to do: Check whether a programming error overrides the browse information.

RC_INVALID_BROWSE_OPTION

Explanation: The browse option in DesGetSearchResultTable is not valid.

What to do: Ensure that the option is BROWSE or NO_BROWSE.

RC_INVALID_MATCH_OPTION

Explanation: The match options used in DesOpenDocument is not valid.

What to do: Check that the option is FAST or EXTENDED.

RC_INVALID_PARAMETER

Explanation: One of the input parameters is incorrect.

What to do: Read the error message returned by Text Extender to determine the cause.

RC_INVALID_SEARCH_OPTION

Explanation: The search option in DesGetSearchResultTable is not valid.

What to do: Ensure that the option is DES_TEXTHANDLEONLY, DES_RANK, DES_MATCH, or DES_RANKANDMATCH.

RC_INVALID_SESSION

Explanation: The session pointer specified in the current service call is incorrect or obsolete.

What to do: Save any information that can help to find the cause of the error, then end the application.

RC_NO_BROWSE_INFO

Explanation: No browse information is returned by Text Extender. This is because the search argument resulted in an empty search result. This is not an error.

What to do: No action necessary.

RC_PARSER_INVALID_ESCAPE_CHARACTER

Explanation: The search criteria contains an incorrect escape character. This error is reported if a blank is used as an escape character or if, for one word or phrase, more than one escape character is specified in the search criteria. Example: `ESCAPE " "` or `ESCAPE "#$"`.

What to do: Check the syntax of the search argument, and try again.

RC_PARSER_INVALID_USE_OF_ESCAPE_CHAR

Explanation: The escape character syntax in the search criteria cannot be interpreted.

What to do: Check the escape character syntax. For example, if $ is the specified escape character, the word or phrase can contain only $$, $_ or $%, where _ and % are the two masking symbols.

RC_PARSER_SYNTAX_ERROR

Explanation: The search criteria syntax cannot be interpreted.

What to do: Check the syntax of the search argument, by referring to "Chapter 10. Syntax of search arguments" on page 173.

RC_RESULT_TABLE_NOT_EXIST

Explanation: You are trying to store the result of a search in a table that does not exist.

What to do: Create a result table as shown in Figure 15 on page 200.

RC_SE_BROWSER_TIME_OUT

Explanation: The browse process was started but did not respond in an acceptable time. Text Extender then canceled the pending process.

This error can occur when your system does not have enough storage space or is overloaded.

What to do: Terminate the browse session by calling DesEndBrowseSession, free allocated storage by calling DesFreeBrowseInfo, and try again.

RC_SE_CAPACITY_LIMIT_EXCEEDED

Explanation: The requested function cannot be processed. There is insufficient memory or disk space.

What to do: End the program and check your system's resources.

RC_SE_COMMUNICATION_PROBLEM

Explanation: Communication with the Text Extender server failed. The error could be caused by a lack of storage space or by an incorrect installation of Text Extender.

What to do: Save any information that can help to find the error, then end the application.

RC_SE_CONFLICT_WITH_INDEX_TYPE

Explanation: The linguistic specification of the search term of the query does not correspond to the type of index. For example, PRECISE FORM OF cannot be used with a linguistic index. The default linguistic specification is used as shown in Table 6 on page 178.

What to do: Adapt your application to prevent the specification of query options that conflict with the index type.

RC_SE_DICTIONARY_NOT_FOUND

Explanation: Text Extender linguistic services cannot find the dictionary files. The query is processed without linguistic support. The dictionary files corresponding to the specified language code(s) are not in the expected path.

What to do: You can continue to make API calls. For UNIX, check that the required dictionary is in the path `{DB2TX_INSTOWNERHOMEDIR}/db2tx/dicts`. If necessary, install the required dictionary.

RC_SE_DOCMOD_READ_PROBLEM

Explanation: When a Text Extender instance is created, a document model file called `desmodel.ini` is put in the instance directory. When you create an index, a `desmodel.ini` file is also put in the index directory `IXnnnnnn`. This document model file could not be read.

What to do: Check that a document model file exists and that it is in the correct directory.

RC_SE_DOCUMENT_NOT_ACCESSIBLE

Explanation: The requested text document is found, but is currently not accessible.

What to do: Check whether the document is accessed exclusively by another task or user.

RC_SE_DOCUMENT_NOT_FOUND

Explanation: The requested text document was not found. The most likely cause is that a text document has been deleted from storage, but has not yet been removed from the Text Extender index. This can also occur if you are trying to browse a document identified by a damaged handle.

What to do: In most cases, you can ignore this return code. It will no longer be displayed after the next index update.

If it is persistent, check that your application program is passing the found handle correctly for browsing.

RC_SE_EMPTY_INDEX

Explanation: The Text Extender index corresponding to the handle column addressed by the search request is empty. Either no text documents have been added to this index or all text documents have been removed from it.

This can occur when a text column has been enabled, but the documents in the column have not yet been indexed. That is, you specified in the ENABLE TEXT COLUMN command to create the index later, at a time determined by the periodic indexing settings.

This can also occur when a text table has been enabled to create an empty common index for all text columns, but none of the text columns has been enabled.

What to do: If ENABLE TEXT TABLE has been used to create an empty common index for all text columns, run ENABLE TEXT COLUMN for at least one of the text columns that contain text to be searched. In this command, you can determine whether the index is created immediately, or at a time determined by the periodic indexing settings.

Run GET INDEX STATUS to check that the index was built successfully.

RC_SE_EMPTY_QUERY

Explanation: The specified search criteria was analyzed and processed linguistically by Text Extender. Either a programming error caused a query to be made containing no search terms, or all search terms were stop words (words not indexed by Text Extender) that are removed from a query. The result was no search terms.

What to do: Reword the query. If the problem persists, check for a programming error.

RC_SE_END_OF_INFORMATION

Explanation: This is not an error. The end of the document has been reached. No further information is available for DesGetMatches.

What to do: Use this return code to end the iterative processing of the document with DesGetMatches.

RC_SE_FUNCTION_DISABLED

Explanation: The requested function called a Text Extender function that has been prevented by the administrator.

What to do: Ask your administrator for assistance. It may be necessary to stop and restart Text Extender (`txstop/txstart`).

RC_SE_FUNCTION_IN_ERROR

Explanation: The requested function has been locked due to an error situation on the Text Extender server. The API call cannot be processed.

What to do: Check the index status. Check the available space in the index directory. Reset the index status and retry the command.

RC_SE_INCORRECT_HANDLE

Explanation: A handle specified in an input parameter such as *browse session handle* is not valid. It must be a handle that was returned by a previous call and that is not obsolete.

What to do: Save any information that can help to find the cause of the error, then terminate the session by calling DesEndBrowseSession.

Check whether a programming error produced an incorrect handle.

RC_SE_INDEX_DELETED

Explanation: The Text Extender index being accessed is deleted.

What to do: Contact the Text Extender administrator to recreate the index.

RC_SE_INDEX_NOT_ACCESSIBLE

Explanation: The Text Extender index cannot be accessed and the current call cannot be processed.

What to do: Ask the Text Extender administrator to check the accessibility of the index.

RC_SE_INDEX_SUSPENDED

Explanation: Text Extender received a request relating to a Text Extender index that was

suspended from another session or from the current session.

What to do: Ask the Text Extender administrator to check the status of the index.

RC_SE_INSTALLATION_PROBLEM

Explanation: Text Extender has encountered an installation problem.

What to do: Check the current setting of the environment variables DB2INSTANCE, DB2TX_INSTOWNER, DB2TXINSTOWNERHOMEDIR. Use `descfgcl -d` and `descfgsv -d -i txins000` to check your search service configuration.

RC_SE_IO_PROBLEM

Explanation: An error occurred when the server attempted to open or read one of its index files. This can be due to one of the following:

An unintentional action by the administrator, such as the deletion of a Text Extender index file

Incorrect setting in the text configuration.

What to do: Terminate the application. Check with the administrator that:

All files of the current Text Extender index exist

The text configuration settings are correct.

RC_SE_LS_FUNCTION_FAILED

Explanation: A function that accessed the database to retrieve text documents for browsing failed. Either the database is no longer accessible to the user, or the user is not authorized for the text table.

What to do: Check that the input to the function, such as the user ID, is correct. Check that the database is accessible and that the user is authorized for the task.

RC_SE_LS_NOT_EXECUTABLE

Explanation: A function that is trying to access the database to retrieve text documents for browsing cannot be executed.

What to do: Check that Text Extender is installed correctly. If the problem persists, contact your IBM representative.

RC_SE_MAX_OUTPUT_SIZE_EXCEEDED

Explanation: An unusually large number of matches have been found. the size of the browse information has exceeded the maximum that can be handled. The request cannot be processed.

What to do: Either make the query more specific or ensure that more system memory is available.

RC_SE_MAX_NUMBER_OF_BUSY_INDEXES

Explanation: The requested function has been prevented by the search service, because the maximum number of indexes is currently active.

What to do: Reissue the function call after a short period of time. In general, the problem is only temporary.

RC_SE_NO_DATA

Explanation: This is not an error. No text document matches the search criteria. If you request browse information, no browse information is returned. No storage is allocated for the browse information.

What to do: No action is necessary.

RC_SE_NOT_ENOUGH_MEMORY

Explanation: There is not enough storage space on the client or on the server system. The current request cannot be processed.

What to do: Release storage space and end the application.

RC_SE_PROCESSING_LIMIT_EXCEEDED

Explanation: The current search request exceeded the maximum result size or the maximum processing time specified for your client/server environment. The request was canceled.

What to do: Make the search request more specific. Consider increasing the maximum processing time.

RC_SE_QUERY_TOO_COMPLEX

Explanation: The specified query is too complex.

What to do: Adapt your application to prevent excessive use of masking characters and synonyms.

Excessive use of masking symbols or excessive use of the SYNONYM option can expand a query to a size that cannot be managed by Text Extender.

RC_SE_REQUEST_IN_PROGRESS

Explanation: A Text Extender browse API service was called while another browse API request was active for the same session.

What to do: End the session by calling DesEndBrowseSession and free storage by calling DesFreeBrowseInfo.

The Text Extender browse API does not support concurrent access to the same browse session.

All applications running concurrently in the same process should handle their own browse sessions.

RC_SE_SERVER_BUSY

Explanation: The Text Extender client cannot currently establish a session with the requested Text Extender server, or the Text Extender server communication link was interrupted and cannot be re-established.

The Text Extender server has been started correctly, but the maximum number of parallel server processes was reached.

What to do: If this is not a temporary problem, change the communication configuration on the Text Extender server.

RC_SE_SERVER_CONNECTION_LOST

Explanation: The communication between client and server was interrupted and cannot be re-established.

The Text Extender server task may have been stopped by an administrator or the server workstation may have been shut down.

What to do: Check whether either of these conditions have occurred, and have them corrected.

RC_SE_SERVER_NOT_AVAILABLE

Explanation: The Text Extender API services could not establish a session with the requested Text Extender server.

The Text Extender server may not have been started.

What to do: Check that the Text Extender server has been started correctly. If the error persists, there is an installation problem.

RC_SE_STOPWORD_IGNORED

Explanation: This informational code is returned when the specified query contained at least one search term consisting only of stop

words. The search term was ignored when processing the query.

What to do: You can continue to issue API calls. Avoid using stop words in Text Extender queries.

RC_SE_UNEXPECTED_ERROR

Explanation: An error occurred that could be caused by incorrect installation of Text Extender.

What to do: End the application, saving any information that may help to find the cause of the error.

RC_SE_UNKNOWN_INDEX_NAME

Explanation: The name of the text index associated with a text column is part of the handle.

What to do: Ensure that the handle you use as input to DesGetBrowseInfo is correct.

RC_SE_UNKNOWN_SECTION_NAME

Explanation: A specified section name is not part of a model specified in a document model file, or of the default model used.

What to do: Specify a section name that is part of the specified model or the default model.

RC_SE_UNKNOWN_SERVER_NAME

Explanation: The name of Text Extender server is part of the handle.

What to do: Ensure that the handle you use as input to DesGetBrowseInfo is correct.

RC_SE_WRITE_TO_DISK_ERROR

Explanation: A write error occurred that could be caused by a full disk on the Text Extender server workstation, or by incorrect installation of Text Extender.

What to do: End the application, saving any information that may help to find the cause of the error. Check that there is enough disk space available at the server.

RC_SQL_ERROR_WITH_INFO

Explanation: An SQL error occurred. An error message is returned.

What to do: Check the error message returned by Text Extender for more information, such as the SQL error message, SQLState and native SQL error code.

RC_SQL_ERROR_NO_INFO

Explanation: An SQL error occurred. No error message is returned.

RC_TEXT_COLUMN_NOT_ENABLED

Explanation: The specified handle column is not a column in the table you specified.

What to do: Check whether the handle column name you specified is correct. Ensure that the text column in that table has been enabled.

Chapter 13. Messages

This chapter describes the following:

- **SQL states returned by UDFs:** These messages can be displayed when you use UDFs.
- **Messages from the DB2TX command line processor:** These messages can be displayed when you enter administration commands using the command line processor DB2TX. Each message number is prefixed by DES.

SQL states returned by UDFs

The user-defined functions provided by Text Extender can return error states. Example:

```
SQL0443N User-defined function
"DB2TX.CONTAINS" (specific name "DES5A")
has returned an error SQLSTATE with
diagnostic text "Cannot open message file".
SQLSTATE=38702
```

The messages in this section are arranged by SQLSTATE number.

01H10 **The file *file-name* cannot be opened.**

What to do: Ensure that the file exists, and that the DB2 instance name has the necessary permissions to open it.

01H11 **The text handle is incomplete**

Explanation: An attempt was made to use a handle that has been initialized, but not completed. A partial handle was created using INIT_TEXT_HANDLE containing preset values for the document language and format. However, the handle has not been completed by a trigger.

What to do: Use only handles that have been completed. If the handle concerned is stored in a handle column, enable or reenable its corresponding text column.

01H12 **Search arguments too long. The second argument was ignored.**

Explanation: The REFINE UDF was used to combine two search arguments, but the combined length of the search arguments is greater than the maximum allowed for a LONG VARCHAR. The REFINE UDF returns the first search argument instead of a combined one.

What to do: Reduce the length of one or both search arguments, then repeat the query.

01H13 **A search argument contains a stopword.**

Explanation: The specified query contains at least one search term consisting only of stop words. The search term was ignored when processing the query.

What to do: Avoid using stop words in Text Extender queries.

01H14 **A language dictionary for linguistic processing is missing.**

Explanation: Text Extender linguistic services cannot find the dictionary files. The query is processed without linguistic support. The dictionary files corresponding to the specified language code(s) are not in the expected path.

What to do: For UNIX, check that the required dictionary is in the path `{DB2TX_INSTOWNERHOMEDIR}/db2tx/dicts`. If necessary, install the required dictionary.

01H15 **A linguistic search term specification does not match the index type.**

Explanation: The linguistic specification of the search term of the query does not correspond to the type of index. For example, PRECISE FORM OF should not be used with a linguistic index. The default linguistic specification is used as shown in Table 6 on page 178.

What to do: Adapt your application to prevent the specification of query options that conflict with the index type.

38700 **The Text Extender library is not current.**

Explanation: An attempt was made to use a handle that can be interpreted only by a later version of the Text Extender library.

What to do: Ensure that the path to the current library version is set correctly, and that you have the necessary permissions to access it.

Look in the DB2 catalog view SYSCAT.FUNCTIONS, in the IMPLEMENTATION column, for the UDF that caused the problem.

38701 *tracefile* **Cannot open this trace file.**

Explanation: An attempt was made to use a trace function that writes to the file DB2TX_TRACEFILE in the directory DB2TX_TRACEDIR. Either the file does not exist, cannot be found, or the necessary permissions for the file are not available.

38702 **Cannot open message file** *message-file***.**

Explanation: A situation occurred that caused Text Extender to attempt to return a message. The file containing the messages either does not exist or cannot be found, or the necessary permissions for the file are not available.

What to do: Ensure that the file exists, that the path is set correctly, and that you have the necessary permissions to open the file.

38704 **The format of the text handle is incorrect.**

Explanation: A handle having an incorrect format was used as an argument for a Text Extender UDF.

What to do: Ensure that the handle was not produced by INIT_TEXT_HANDLE.

38705 *udfname* **Incorrect UDF declaration.**

Explanation: The specific name of a UDF has been changed in the script where the UDFs are declared. UDF names can be changed, but not their specific names.

What to do: Check the script DESCVDF.DDL that contains the UDF declarations, to ensure that the correct names are still being used. Check the names against those in the original distribution media.

38706 *attribute* **Cannot recognize this attribute value.**

Explanation: An attempt was made to set a CCSID, format, or language to an unknown value.

What to do: Refer to "Information about text documents" on page 234 for the correct values.

38707 **The requested function is not yet supported.**

Explanation: The specified function is not yet supported.

What to do: Check the specified function.

38708 *return code*

Explanation: An error occurred while processing the search request.

What to do: Refer to the description of the return code in "Chapter 12. Return codes" on page 209.

38709 **Not enough memory available.**

Explanation: Not enough memory is available to run the UDF.

What to do: Close any unnecessary applications to free memory, then try again.

38710 *errornumber* **Cannot access the search results.**

Explanation: An error occurred while attempting to read the list of found documents (result list) returned by the search service.

What to do: Try repeating the search. If this is not successful, restart the search service. If the problem persists, report it to your local IBM representative, stating the error number.

38711 **Severe internal error.**

Explanation: A severe error occurred.

What to do: Report the error to your local IBM representative, stating the circumstances under which it occurred.

38712 *indexname* **Incorrect handle in this text index.**

Explanation: A handle has been damaged.

What to do: Use UPDATE INDEX to rebuild the index.

38714 **Shorten DB2TX_INSTOWNERHOMEDIR environment variable.**

Explanation: The name of the home directory of the instance owner must be no longer than 256 characters.

What to do: Use links to reduce the length of the directory name.

38717 **The specified thesaurus could be found.**

Explanation: The specified thesaurus cannot be found.

What to do: Check the specified thesaurus name.

38718 **The specified relation name could not be found in the thesaurus.**

Explanation: The specified relation does not exist in the specified thesaurus.

What to do: Ensure that the specified relation exists.

38719 **A search processing error occurred. Reason code: %s.**

Explanation: The search could not be made due to the specified reason.

What to do: Try to solve the problem reported by the reason code. If the specified reason is not helpful and no further information is found in the `desdiag.log` file, create a trace and report the information to your local IBM representative.

38720 **A shared memory attach error occurred.**

Explanation: The system is unable to get access to shared memory.

What to do: Check your system configuration and increase shared resources, or check the current shared resource usage (ipcs) and clean up resources that are no longer needed.

38721 A semapore creation/access error occurred.

Explanation: The system is unable to create or get access to a semaphore.

What to do: Check your system configuration and increase shared resources, or check the current shared resource usage (ipcs) and clean up resources that are no longer needed.

38722 A search process didn't return.

Explanation: An error occurred while processing the search request.

What to do: Verify your system configuration `descfgcl` and check if all nodes are up and running.

38723 The index CCSID and query CCSID do not match.

Explanation: The database CCSID used for the query string is not the same as the CCSID of the text index.

What to do: Disable the text index and recreate it using the CCSID of the database.

38724 The section or model name is incorrect.

Explanation: The specified section or model name in the query is incorrect.

What to do: Check the section or model name.

38726 A model-file read error occurred.

Explanation: The model-definition file was not found or cannot be opened.

What to do: Check that the model-definition file exists in the index directory.

Messages from Text Extender

Each message has a message identifier that consists of a prefix (DES), the message number, and a suffix letter. The suffix letter indicates how serious the occurrence is that produced the message:

I Information message

W Warning message

N Error (or "negative") message

C Critical error message.

DES0001N Incorrect number of arguments for the db2txinstance command.

Explanation: The `db2txinstance` command needs two arguments.

What to do: Enter the command again with these arguments:

```
db2txinstance instanceName db2InstanceName
```

where *instanceName* is the login name of an existing UNIX user that is being assigned as the owner of this instance, and *db2InstanceName* is the login name of the owner of the corresponding DB2 instance.

DES0002N Invalid instanceName.

Explanation: The specified instance name must be the login name of an existing UNIX user.

What to do: Correct the instance name, or select

an existing UNIX user, or create a UNIX user to be the instance owner.

Enter the `db2txinstance` command again as follows:

```
db2txinstance instanceName
```

where *instanceName* is the login name of the selected UNIX user.

DES0004N The specified instance already exists. The command cannot be processed.

Explanation: The *instanceName* specifies the login name of a UNIX user that is the owner of the instance. This instance owner already has a `db2tx` directory in the home directory.

What to do: To create the instance, remove the existing instance and then try the command again.

DES0005N The installation message catalog cannot be found.

Explanation: The message catalog required by the installation scripts is missing from the system; it may have been deleted or the database products may have been loaded incorrectly.

What to do: Verify that the db2tx_01_01_0000.client product option is installed correctly. If there are verification errors, reinstall the option.

DES0015W A linguistic search term specification does not match the index type.

Explanation: The linguistic specification of the search term of the query does not correspond to the type of index. For example, PRECISE FORM OF should not be used with a linguistic index. The default linguistic specification is used as shown in Table 6 on page 178.

What to do: Adapt your application to prevent the specification of query options that conflict with the index type.

DES0016W A language specification is not supported for the current index type.

Explanation: The language you have specified is not supported for the specified index type.

What to do: See the documentation for a list of supported languages for the index type.

DES0017W Feature extraction has not been enabled.

Explanation: You used a feature search argument in your query but the index was not build with index option FEATURE_EXTRACTION.

What to do: Change the index option to FEATURE_EXTRACTION.

DES0018W *option* **is not supported for the current index type.**

Explanation: You requested a search option that is not supported for the current index type and index option.

What to do: Check which index type or index option supports the requested search option. See Table 6 on page 178.

DES0121N Memory could not be allocated (malloc failed).

Explanation: No storage could be reserved for the application.

What to do: Increase the paging space.

DES0333N A text index file I/O problem occurred.

Explanation: The Text Extender client cannot establish a session with the requested server.

What to do: Check that the Text Extender server has been started. If not, run TXSTART.

DES0709W The dictionary for the specified language is not installed.

Explanation: Text Extender cannot find the dictionary files.

What to do: Install, or reinstall the dictionary for the specified language.

DES0377N A text index file I/O problem occurred.

Explanation: Text Extender cannot access the text index. This can happen if the DIRECTORY setting in the text configuration points to an invalid directory.

What to do: Check the text configuration settings.

DES0700N The node number value '%s1' is not contained in the node group definition.

Explanation: The specified node number is invalid.

What to do: Check the DB2 node number.

DES0701N The node number value '%s1' is out of range."

Explanation: The specified node number is invalid.

What to do: Check the DB2 node number.

DES0704N Format '%s1' requires the specification of an index property.

Explanation: The document format is not compatible with the index type information.

What to do: Specify an index property that is compatible with the document format.

DES0705N The specified document model name '%s1' was not found in the model definition file.

Explanation: The document model name was not found in the model definition file. Not that the model name is case-sensitive.

What to do: Use a model name that is specified in the model definition file.

DES0706N The model definition file cannot be accessed on the DB2 Text Extender server.

Explanation: The model definition file was not found or cannot be opened.

What to do: Check that the model definition file exists.

DES0707N Format '%s1' does not support the specified index property.

Explanation: The document format does not support the index property.

What to do: Specify an index property that is compatible with the document format.

DES0710N A null pointer is not allowed for parameter '%s1'.

Explanation: No value is specified for parameter %s1.

What to do: Specify a value for parameter %s1.

DES0711N An internal Text Extender error occurred. Diagnosis information: '%s1'.

Explanation: An internal processing error occurred.

What to do: Check the diagnostic message to solve the problem. If the internal error was not caused by an installation problem, additional information may be in the desdiag.log file or in a created trace file. If this does not help, collect the available information and call your IBM service representative.

DES0712N Parameter '%s1' is too long.

Explanation: The specified parameter %s1 is out of range.

What to do: Specify the parameter %s1 using a valid length.

DES0713N The length of parameter '%s1' is incorrect: %d1.

Explanation: The specified parameter %s1 is out of range.

What to do: Specify the parameter %s1 using a valid length.

DES0714N Specify parameter *parameter* either directly or in the configuration table.

Explanation: CCSID, format, or language was not specified, and there is no text configuration setting for this value.

What to do: Either specify the missing parameter directly in the ENABLE TEXT COLUMN command, or set a value in the text configuration settings.

DES0715N Data type *schema.type* is not supported for text data.

Explanation: *schema.type* is the schema name and type name of the text column or the result of an access function. The data type for a text column is not supported by Text Extender. It must be CHAR, GRAPHIC, VARGRAPHIC, LONG VARGRAPHIC, DBCLOB, VARCHAR, LONG VARCHAR, or CLOB. If this is not the case, you must provide an access function whose input is the data type of the text column and whose output is VARCHAR, LONG VARCHAR, or LOB.

What to do: If *schema.type* is a text column type, you must register an access function with a result of type VARCHAR, LONG VARCHAR, or LOB. If *schema.type* is the result of an access function, it cannot be used. Provide an access function with a result of the required type.

DES0716N Format *format* is not supported.

Explanation: *format* is a format that is not supported by Text Extender.

What to do: Check the list of supported formats in "Formats" on page 235.

DES0717N Language *language* is not supported.

Explanation: *language* is a language that is not supported by Text Extender.

What to do: Check the list of supported languages in "Languages" on page 236.

DES0718N CCSID *ccsid_value* is not supported.

Explanation: You specified an invalid CCSID value.

What to do: See the documentation for a list of supported CCSIDs.

DES0719N A call to the Text Extender program *program* failed with return code *rc*.

Explanation: An error may have occurred during installation. The return codes are listed in file DES_EXT.H.

What to do: Check if the installation was successful. Check that the environment variables such as DB2TX_INSTOWNER and DB2TX_INSTOWNERHOMEDIR are set correctly.

DES0720N The access function *schema.function* is not registered in the database.

Explanation: The name of the function is either incorrect or has not been registered with the database.

What to do: Check the name of the access function. If it is correct, check that the function is known to the database system. Use the CREATE FUNCTION to register the access function with the database.

DES0721N **The database is inconsistent; a Text Extender catalog view is missing.**

Explanation: One of the Text Extender catalog views is not in the database.

What to do: Use the DISABLE DATABASE command to remove the remaining catalog views, then enter ENABLE DATABASE again. The index data is lost; reindex the text documents.

DES0722N **Table** *schema.table* **is not a base table in the database.**

Explanation: Either the table does not exist in the database or it is a result table or a view. A text column must be in a base table before it can be enabled for Text Extender.

What to do: Ensure that the table name is correct, and that it is a base table.

DES0723N **The creation of an index for the handle column** *handlecolumnname* **in table** *schema.table* **failed.**

Explanation: A text index could not be created for the handle column.

What to do: Use `txstatus` to check the status of the server. If the services on the server are running correctly, use DISABLE TEXT COLUMN or DISABLE TEXT TABLE to get a consistent state again. Then enable the text column again using ENABLE TEXT COLUMN or ENABLE TEXT TABLE.

DES0724N **An entry in the TextIndices catalog view for the handle column** *handlecolumn* **in table** *schema.table* **is missing.**

Explanation: The TextIndices catalog view is damaged.

What to do: Use DISABLE TEXT COLUMN or DISABLE TEXT TABLE to get a consistent state again. Then enable the text column using ENABLE TEXT COLUMN or ENABLE TEXT TABLE.

DES0727N **Column** *column* **in table** *schema.table* **is already enabled.**

Explanation: This message can occur if the table has been dropped and then recreated using the same text column, without first disabling the column.

What to do: Disable the column, then try again.

DES0728N **Column** *column* **does not exist in table** *schema.table***.**

Explanation: You are trying to enable a text column that does not exist.

What to do: Change the table name or the column name, then try again.

DES0729N **Handle column** *handlecolumn* **does not exist in table** *schema.table***.**

Explanation: You are trying to use a handle column that does not exist.

What to do: Use the GET STATUS command to check if the handle column exists, and that its name has been specified correctly.

DES0730N **Table** *schema.table* **is already enabled as a common-index table.**

Explanation: You are trying to enable a table that has already been enabled as a common-index table.

What to do: Either continue without enabling the table, or run the DISABLE TEXT TABLE command to disable the table before enabling it again.

DES0731N **Table** *schema.table* **is not enabled for Text Extender; it cannot be disabled.**

Explanation: You are trying to disable a table that has not been enabled.

What to do: Check the table name.

DES0732N **The update frequency is incorrect near location** *location***; expected was** *parameter***.**

Explanation: The *parameter* specification for the Update Frequency was not correct.

What to do: Check the update frequency parameter and reenter the command.

DES0733N **Table** *schema.table* **contains an enabled column; it cannot be enabled as a common-index table.**

Explanation: This table contains a text column that already has its own index. You cannot create a common index for all the text columns while this individual index exists.

What to do: Use DISABLE TEXT COLUMN to disable the enabled columns, then enter the ENABLE TEXT TABLE command again.

DES0734N **Handle column** *handlecolumn* **belongs to the partial-text table** *schema.table***; it cannot be disabled separately.**

Explanation: You cannot disable a single text column in a table that was enabled as a partial-text table.

What to do: Disable the complete partial-text table.

DES0736N *handlecolumn* **is already a handle column in table** *schema.table***.**

Explanation: You are trying to use an existing handle column name.

What to do: Reenter the command, using a different name for the handle column.

DES0737N **Table** *schema.tablename* **is enabled as a common-index table with STORAGE option** *storage_option***.**

Explanation: It is not possible to enable a common index table for external files.

What to do: If you want to enable a table for external files, use a multi-index table.

DES0738N **Access function** *schema.function* **has incorrect parameters.**

Explanation: The input or output parameters of *schema.function* are incorrect.

- There can be only one input parameter, and it must be of the data type of the text column to be enabled.
- The output parameter must be of type CHAR, GRAPHIC, VARGRAPHIC, LONG VARGRAPHIC, DBCLOB, VARCHAR, LONG VARCHAR, or CLOB.

DES0739W **The index update program for table** *schema.table***, handle column name** *handlecolumn***, could not be started.**

Explanation: The program that updates indexes could not be started. An error may have occurred during installation.

What to do: Check if the installation was successful. Check that the environment variables such as DB2TX_INSTOWNER and DB2TX_INSTOWNERHOMEDIR are set correctly.

DES0740N **Handle column '%s1' can be reused only for a text column of type '%s2.%s3'.**

Explanation: The handle column has already been used for another handle column type.

What to do: Specify a new handle column name.

DES0741N **The program or file** *parameter* **was not found or could not be started.**

Explanation: The ENABLE DATABASE or DISABLE DATABASE command could not open the file *parameter*. An error may have occurred during installation.

What to do: Check if the installation was successful.

DES0742N This table uses column indexes. Specify a handle column in the command.

Explanation: The specified table is enabled as multi index table. To work with a specific column specify the related handle column.

What to do: Specify a handle column.

DES0745N The DB2TX instance owner *instance-owner* is not a valid user ID.

Explanation: The environment variable DB2TX_INSTOWNER does not contain a valid user ID.

What to do: Correct the environment variable.

DES0747N The current CCSID is not supported for index type *index_type*.

Explanation: You specified a CCSID that is not supported for the requested index type.

What to do: See the documentation for a list of supported CCSIDs.

DES0748N The commit count value '%s1' is not supported by DB2 Text Extender.

Explanation: The specified commit count value is not supported.

What to do: Specify a valid commit count value (see Administration and Programming guide).

DES0749N The update index value '%s1' is not known by DB2 Text Extender.

Explanation: The specified 'update index' value is invalid.

What to do: Specify a valid 'update index' value (see Administration and Programming guide).

DES0750N The index type value '%s1' is not known by DB2 Text Extender.

Explanation: The specified 'index type' value is invalid.

What to do: Specify a valid 'index type' value (see Administration and Programming guide).

DES0751N You do not have the authorization to perform the specified operation.

Explanation: You do not have the required database administrator authorization to do this operation.

What to do: Have this operation done by a database administrator.

DES0756N The database is not enabled for Text Extender.

Explanation: The database must be enabled before this command can be run.

What to do: Run ENABLE DATABASE, then resubmit the command.

DES0763N The update frequency is incorrect.

Explanation: The specified 'update frequency' value is invalid.

What to do: Specify a valid 'update frequency' (see Administration and Programming guide).

DES0765N The database is already enabled for Text Extender.

Explanation: You are trying to enable a database that is already enabled.

What to do: Either continue without enabling the database, or use DISABLE DATABASE to disable the database before enabling it again.

DES0766N An action has caused the maximum row size of the table or a temporary table to be exceeded.

Explanation: The ENABLE TEXT COLUMN command adds a handle column to the table. If

the table is already large, this can cause the row size of the table to exceed the maximum value of 4005.

The ENABLE TEXT COLUMN command also creates a temporary table whose size is proportional to the number of text columns that are already enabled. If many text columns are already enabled, the size of the temporary table may exceed the maximum value.

What to do: Use the ENABLE TEXT COLUMN only on tables that do not cause this limit to be exceeded.

DES0769W Warning: Index characteristic have been specified but will be ignored. Table %s1.%s2 is a common-index table.

Explanation: The specified table is a common index table therefore no index characteristics can be specified.

What to do: No action required

DES0770N The environment variable *env-variable* is not defined.

Explanation: A parameter for a command was not specified and the system tried to read the default value from the environment variable *env-variable*, but this environment variable is not defined.

What to do: Define the required environment variable.

DES0774N The value length %d1 for variable '%s1' is out of range.

Explanation: The value length of parameter %s1 is out of range.

What to do: Specify the parameter %s1 using a valid length.

DES0775N The index directory value '%s1' is incorrect.

Explanation: The index directory value is incorrect, may be the directory length is incorrect.

What to do: Specify a valid index directory value.

DES0776N The table space name '%s1' is incorrect.

Explanation: The specified table space name is incorrect, may be the table space value length is incorrect.

What to do: Specify a valid table space value.

DES0777N The table space '%s1' is not known by the database management system.

Explanation: The specified table space is not known to the database system.

What to do: Check that the specified table space exists in the database.

DES0778N '%
s1' is not a REGULAR table space. It was created with keyword"
'%s2'.

Explanation: Data type for specified table space is not supported.

What to do: Specify a regular table space.

DES0779I Indexing has been started successfully. To check indexing status use 'GET INDEX STATUS'.

Explanation: The indexing program has started. You can use the 'GET INDEX STATUS' command to check the status of the indexing process.

What to do: Check output of "GET INDEX STATUS' command.

DES0780I **Index reorganization has been started successfully. To check the index status use 'GET INDEX STATUS'.**

Explanation: The reorganization program has started. You can use the 'GET INDEX STATUS' command to check the status of the reorganization process.

What to do: Check output of "GET INDEX STATUS' command.

DES0789W **Warning: The partitioning map of the current nodegroup has been updated, please call the TXNCHECK utility.**

Explanation: The partitioning map of the current nodegroup has been updated.

What to do: Use "TXNCHECK' command.

DES0800I **The %s1 command completed successfully.**

Explanation: The specified command completed successfully.

What to do: No action required.

DES0810N **Closing quotation mark is missing.**

Explanation: A quotation mark has been found, but the second quotation mark is missing.

What to do: Check the syntax of the command and try again.

DES0811N *"token"* **is unexpected. Check the index characteristics or the text information.**

Explanation: The index characteristics or the text information is incorrect.

What to do: Check the syntax and try again.

DES0812N **Table** *schema.table* **does not exist or is not enabled for DB2 Text Extender.**

Explanation: While running the GET command, either the name of a database table is incorrect, or the table does not exist, or it has not yet been enabled.

What to do: If the table name is correct, use GET STATUS to check that it has been enabled. Enable the table and try again.

DES0813N **Table** *schema.table* **does not exist or is not enabled for DB2 Text Extender or does not contain a handle column** *column***.**

Explanation: While running the GET command, no entries for the handle column are found in the table. If the table exists, it is not enabled or it does not contain a handle column.

What to do: If the table name is correct, use GET STATUS to check that it has been enabled. Enable the table and try again.

DES0814N **Table %s1.%s2 does not exist or is not enabled for DB2 Text Extender or no text column is enabled within this table.**

Explanation: The specified table is not enabled for Text Extender.

What to do: Enable the table for Text Extender.

DES0815N **Empty quotes "" found. A name is expected inside the quotes.**

Explanation: Two consecutive quotation marks were found with no text between them.

What to do: Check the syntax and try again.

DES0816N **The word** *"token"* **is unexpected. Use one of the keywords** *keyword* **or** *keyword***.**

Explanation: An unexpected token was found.

What to do: In the command, use one of the

keywords given in the message.

DES0817N *"token"* **is unexpected. Use the keyword** *keyword***.**

Explanation: An unexpected token was found.

What to do: In the command, use the keyword given in the message.

DES0818N **Unexpected end of command. The keyword** *keyword* **is expected.**

Explanation: A keyword is missing.

What to do: In the command, use the keyword given in the message.

DES0819N **Unexpected end of command. One of the following keywords is expected:** *keyword* **or** *keyword***.**

Explanation: A keyword is missing.

What to do: In the command, use one of the keywords given in the message.

DES0820N **Index option** *index_option* **is not supported for index type** *index_type***.**

Explanation: You specified an index option that is not supported for the given index type.

What to do: See the documentation for supported index options for the given index type.

DES0821N **The name** *"token"* **is too long. Only** *nn* **characters are allowed for** *variable* **names.**

Explanation: A name is too long.

What to do: Specify a name having an acceptable length.

DES0822N **The command contains an unrecognized token** *"token"***. End of command is expected.**

Explanation: End of command found, but a keyword is expected.

What to do: Check the syntax of the command and try again.

DES0823N **A table name is expected following** *"schema."***.**

Explanation: A table name or a function name is missing after the ".".

What to do: Check the syntax of the command and try again.

DES0824N **Unexpected end of command; a** *keyword* **is required.**

Explanation: The keyword in the message is missing from the syntax.

What to do: Check the syntax of the command and try again.

DES0825N **'%s1' is not a known database alias name. Only %d1 characters are allowed.**

Explanation: The specified database alias name is unknown to the database system.

What to do: Check that the specified alias name is valid.

DES0826N **Database alias** *alias* **must not be in quotation marks.**

Explanation: The name in the message has been interpreted as a database alias. It must not be in quotation marks.

What to do: Check the syntax of the command and try again.

DES0827N **The CCSID *"ccsid"* is not supported.**

Explanation: The CCSID is not one of those supported by Text Extender.

What to do: Refer to the documentation for a list of the supported CCSIDs.

DES0829N **The user name *userid* must not be in quotation marks.**

Explanation: You entered a user name in quotation marks.

What to do: Remove the quotation marks.

DES0830N **Parameter *"parameter"* in the *enable/disable* DATABASE command not recognized. End of command expected.**

Explanation: The commands ENABLE DATABASE and DISABLE DATABASE do not take parameters.

What to do: Enter the command again without parameters.

DES0831N **Unexpected end of command. The table name is missing.**

Explanation: The administration command requires a table name.

What to do: Enter the appropriate table name.

DES0832N **Unexpected end of command. The database name is missing.**

Explanation: The administration command requires a database name.

What to do: Enter the appropriate database name.

DES0833N **Unexpected end of command. The column name is missing.**

Explanation: The administration command requires a column name.

What to do: Enter the appropriate column name.

DES0899N **Unknown DB2TX command: *command*.**

Explanation: The specified command is not supported by Text Extender

What to do: Type **db2tx ?** to get a list of the commands.

DES0971N **Index directory can be specified once without node specification or multiple times with node specification.**

Explanation: The specification of the index directory/ies is not correct.

What to do: Check the specification of the index directory. You can specify one index directory without a node specification or multiple index directories with node specification.

DES0972N **The node specification is not correct. An unsigned digit value is expected.**

Explanation: A non digit value is specified for the node number.

What to do: Specify an unsigned digit value for the node number.

DES0973N **The node specification is not correct. One or more unexpected characters found before right parenthesis.**

Explanation: The node specification is syntactical incorrect.

What to do: Check the syntax of the node specification and try again.

DES0974N The sequence of the node numbers in a TO clause is not correct (second node smaller than first node).

Explanation: The node specification is syntactical incorrect.

What to do: Check the syntax of the node specification and try again.

DES0975N The syntax for the specification of the node information is not correct.

Explanation: The node specification is syntactical incorrect.

What to do: Check the syntax of the node specification and try again.

DES0976N The node information is incomplete.

Explanation: The node specification is incomplete - some information is missing.

What to do: Check the syntax of the node specification and try again.

DES0977N The node information is incomplete. The left parenthesis is missing.

Explanation: The node specification is incomplete - left parenthesis is missing.

What to do: Correct the node specification and try again.

DES0998N The document model name length is incorrect.

Explanation: The length of the 'document model name' value is incorrect.

What to do: Check the model name value and try again.

DES0999N The syntax for the specification of the document model(s) is not correct.

Explanation: The specification of the model name(s) is syntactical incorrect.

What to do: Check the syntax of the model(s) specification and try again.

DES9994N A Text Search Engine error occurred. Reason code: reason-code

Explanation: The text search engine used by Text Extender raised an error.

What to do: Check the search engine reason code (use TSE documentation). If the reported reason does not help to solve the problem additional information may be in the desdiag.log file or in a created trace file. If this does not help collect the available information and call your IBM service representative.

DES9995N A Text Extender error occurred. Message text: message-text

Explanation: A Text Extender error occurred.

What to do: Use the message provided by Text Extender to solve the problem. If the reported message does not help to solve the problem additional information may be in the desdiag.log file or in a created trace file. If this does not help collect the available information and call your IBM service representative.

DES9996N An internal Text Extender error occurred. Reason code: *reason_code*

Explanation: An internal processing error occurred.

What to do: Check that the Text Extender installation has been completed successfully. If yes, note the reason code and call your IBM service representative.

DES9997N **An SQL error occurred. SqlState:** *state* **QL Error code:** *rc;* **SqlErrorMessage:** *message*

Explanation: An SQL error occurred.

What to do: Take action on the SQL error message that is displayed with the message.

DES9998N **An SQL error occurred. No further information is available.**

DES9999N **No corresponding error message.**

Explanation: An internal processing error occurred.

What to do: Check the diagnostic message to solve the problem. If no installation problem causes the internal error additional information may be in the desdiag.log file or in a created trace file. If this does not help collect the available information and call your IBM service representative.

Chapter 14. Configuration

This chapter describes the Text Extender environment variables and configuration information. Both of these let you specify default values for many parameters needed by Text Extender.

Environment variables

The environment variables set the default values of environment parameters. To display the current setting of environment variables, use the GET ENVIRONMENT command described in "Displaying the settings of the environment variables" on page 65.

DB2DBDFT
Default server name. The name of the DB2 UDB for OS/390 server that is assumed if no server name is specified.

DB2TX_INSTOWNER
Text Extender instance name. This is the login name of the user that owns the instance.

DB2TX_INSTOWNERHOMEDIR
Instance owner's home directory.

Text configuration settings

Text configuration settings are created when you enable a database. These are default settings for text, index, and processing characteristics. You can display and change these default settings; see "Displaying the text configuration settings" on page 65 and "Changing the text configuration" on page 42.

Text characteristics

"Information about text documents" on page 234 describes the document formats, languages, and CCSIDs supported by Text Extender. Default values for these are required by various administration commands.

When Text Extender is installed, the default text configuration settings are:

FORMAT
TDS

LANGUAGE
The LANGUAGE that was set for the database

CCSID
The CCSID that was set for the subsystem

Index characteristics

DIRECTORY
Directory to be used to store the index.

Initial setting: *DB2TX_INSTOWNER*/db2tx

INDEXTYPE
Index type to be used. See "Types of index" on page 11 for a description.

Initial setting: NGRAM

UPDATEFREQ
Frequency for periodic index update. See "Setting the frequency of index updates" on page 240 for a description.

Initial setting: NONE

Processing characteristics

UPDATEINDEX
Setting to determine when the first index update occurs: either immediately after the index is created (UPDATE), or later according to the update frequency settings (NOUPDATE).

Initial setting: UPDATE

COMMITCOUNT
Setting to determine after how many insert or update statements Text Extender issues a DB2 UDB for OS/390 commit statement. See "Enabling a text column in a large table" on page 52.

Initial setting: 10000

Information about text documents

Each text document that you intend to search has three characteristics that are significant to Text Extender:

Format

Language

Coded Character Set Identifier (CCSID).

Formats

Text Extender needs to know the format (or type) of text documents, such as WordPerfect or ASCII, that you intend to search. This information is needed when indexing text documents.

The text document types supported are:

HTML
Hypertext Markup Language

ASCII_SECTIONS
Structured ASCII containing sections

TDS Flat ASCII

AMI AmiPro Architecture Version 4

FFT IBM Final Form Text: Document Content Architecture

MSWORD
Microsoft Word, Versions 5.0 and 5.5

RFT IBM Revisable Form Text: Document Content Architecture

RTF Microsoft Rich Text Format (RTF), Version 1

WP5 WordPerfect (OS/2 and Windows), Versions 5.0, 5.1, and 5.2

For nonsupported document types, specify a numeric ID. Valid values are 1 to 100. This value is passed as the source format to the user exit that converts the original format to TDS.

If, during indexing, there is a document that is not one of the supported types, Text Extender provides an exit that writes the document to a disk and calls a program that you provide to extract the text into one of the supported formats.

To enable the user exit, edit the following ASCII files:

```
$DB2TX_INSTOWNERHOMEDIR/db2tx/descl.ini
$DB2TX_INSTOWNERHOMEDIR/db2tx/txins<i>nnn</i>/dessrv.ini
```

by adding the following statements:

```
[DOCUMENTFORMAT]
USEREXIT=name_of_executable
```

where <name_of_executable> is the name of the user exit. You can specify a fully qualified file name, or, if the user exit is stored in a directory that is in the PATH statement, you can specify only the file name.

Configuration

The parameters of the user exit must be as follows:

```
<name_of_user_exit>  -sourcefile   <sourcefilename>
                     -targetfile   <targetfilename>
                     -sourceccsid  <sourceccsid>
                     -targetccsid  <targetccsid>
                     -sourceformat <sourceformat>
                     -targetformat <targetformat>
```

The user exit must read the document from the <sourcefilename> and write the converted document to the <targetfilename>. The file names must be fully qualified. The target file must match the <targetccsid> and <targetformat>. The target format must be TDS. The target CCSID must be 850.

During enabling, a format other than TDS (flat ASCII) must be specified as format to force the user exit to be called.

Languages

Text Extender also needs to know in which language a document is written so that the correct dictionary can be used for the linguistic processing that occurs. Here is a list of the language parameters that you can specify when you enable a text column or external documents:

Brazilian Portuguese
BRAZILIAN

Canadian French
CAN_FRENCH

Catalan
CATALAN

Chinese, simplified
S_CHINESE

Chinese, traditional
T_CHINESE

Danish
DANISH

Dutch DUTCH

Finnish
FINNISH

French
FRENCH

German
GERMAN

Icelandic
ICELANDIC

Italian ITALIAN

Japanese
JAPANESE

Korean
KOREAN

Norwegian, Bokmal
BM_NORWEGIAN

Norwegian, Nynorsk
NN_NORWEGIAN

Norwegian, Bokmal and Nynorsk
BMNN_NORWEGIAN

Portuguese
PORTUGUESE

Russian
RUSSIAN

Spanish
SPANISH

Swedish
SWEDISH

Swiss German
SWISS_GERMAN

UK English
UK_ENGLISH

US English
US_ENGLISH

CCSIDs

Each DB2 database uses a particular code page for storing character data. Text Extender, as an application working with DB2, runs using the same code page as the database.

Documents can be indexed if they are in one of the following CCSIDs. During search the CCSID of the database is used to interpret the CCSID of the search string.

Data stored in DB2 UDB for OS/390 character datatypes, such as VARCHAR or CLOB, are converted by DB2 UDB for OS/390 into the CCSID of the

database. So, when enabling a text column for search, use the CCSID of the database as the CCSID parameter. When you enable a text column for search, you can avoid data conversion by DB2 by using a BLOB or binary datatype, and using the actual CCSID of the documents.

Note:

CCSIDs 861, 865, and 4946 are not supported by DB2 UDB for OS/390. To index documents having these CCSIDs, store the documents in a column with a binary data type (BLOB or FOR BIT DATA).

EBCDIC

37 US, Canadian English

273 Austrian, German

277 Danish, Norwegian

278 Finnish, Swedish

280 Italian

284 Spanish, Latin American

285 UK English

297 French

420 Arabic

424 Hebrew

437 US English

500 International Latin-1

871 Icelandic

1025 Russian

ASCII

819 AIX, HP, SUN
Latin-1

850 AIX, OS/2
Latin-1

860 OS/2
Portuguese

861 See note
Icelandic

862 OS/2
Hebrew

864 OS/2
Arabic

863 OS/2
Canadian

865 See note
Danish, Norwegian

866 OS/2
Russian

915 AIX, OS/2, HP
Russian

916 AIX
Hebrew

1064 AIX
Arabic

1089 AIX, HP
Arabic

1250 WIN
Croatian

1251 WIN
Russian

1252 WIN
Latin-1

1255 WIN
Hebrew

1256 WIN
Arabic

DBCS

932 AIX, OS/2
Japanese, combined SBCS/DBCS

942 OS/2
Japanese, combined SBCS/DBCS

943 OS/2, WIN
Japanese, combined SBCS/DBCS

5039 HP
Japanese, combined SBCS/DBCS

954 AIX, HP, SUN
Japanese

949 OS/2
Korean

970 AIX, HP, SUN
Korean

1363 WIN
Korean

948 OS/2
Chinese (traditional), combined SBCS/DBCS

950 AIX, HP, OS/2, SUN, WIN
Chinese (traditional), combined SBCS/DBCS

964 AIX, HP, SUN
Chinese (traditional), combined SBCS/DBCS

1381 OS/2, WIN
Chinese (simplified), combined SBCS/DBCS

1383 AIX, HP, SUN
Chinese (simplified), combined SBCS/DBCS

1386 AIX, OS/2, WIN
Chinese (simplified), combined SBCS/DBCS

4946 See note
Latin-1 (CP850)

5039 HP
Japanese

Setting the frequency of index updates

When a text document is added to a database, or when an existing document in a database is changed, the document must be indexed to keep the content of the index synchronized with the content of the database. When a text document is deleted from a database, its terms must be removed from the index.

Information about which documents are new, changed, and deleted is automatically stored by triggers in a log table. The documents listed in the log table are indexed the next time an index update takes place.

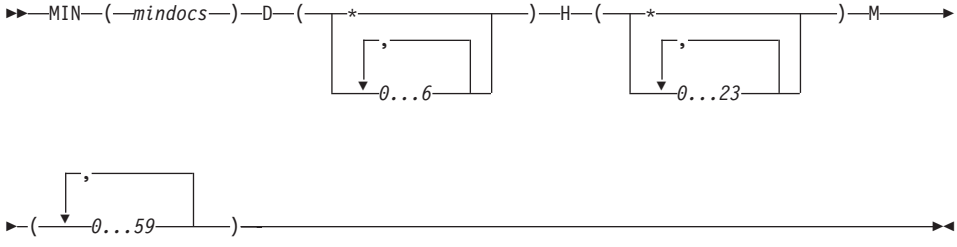
The UPDATE INDEX command lets you update an index immediately on request, but, typically, you automatically update an index at intervals specified in the environment variable DB2TXUPDATEFREQ. The environment

variable determines the default settings. The default settings can be overridden when creating an index using the ENABLE TEXT COLUMN or ENABLE TEXT TABLE commands. The update frequency can be changed for an existing index using the CHANGE INDEX SETTINGS command.

You specify the index update frequency in terms of when the update is to be made, and the minimum number of text documents that must be queued. If there are not enough documents in the log table at the day and time given, the index is not updated.

You should plan periodic indexing carefully; indexing text documents is a time- and resource-consuming task. The time taken is dependent on many factors, such as how many text documents have been added or changed since the previous index update, the size of the documents, and how powerful the processor is.

Syntax



MIN mindocs
The minimum number of text documents that must be queued before the index can be updated.

D The day(s) of the week when the index is updated:

- ***** Every day
- **0** Sunday
- **1** Monday
- **2** Tuesday
- **3** Wednesday
- **4** Thursday
- **5** Friday
- **6** Saturday

H The hour(s) of the specified day(s) when the index is updated:

***** Every hour

0...23 At the specified hour

M The minute(s) of the specified hour(s) when the index is updated:

0...59 At the specified minute

Example: `min(100) d(1,2,3,4,5) h(12,15) m(0)`

If, at 12:00 or 15:00, on Monday to Friday, there are at least 100 text documents queued, the index is updated.

You can combine several frequency specifications:

Example: `min(1) d(*) h(22) m(0) ; min(100) d(1,2,3,4,5) h(12,15) m(0)`

Index updating is scheduled on Monday to Friday at 12:00 and 15:00 as before, but, in addition, each day at 22:00 the index is updated even if there is only one text document in the log table.

Chapter 15. Sample API program

Text Extender provides a sample program, DESSAMP1.C, located in the SAMPLES directory.

DESSAMP1.C is an example of a program that uses the DesGetSearchResultTable function and your own browser program. It follows the sequence of API function calls shown in Figure 14 on page 99.

You need access to an enabled database and an enabled text column. To run this program, do the following:

1. Optional. Copy the source file DESSAMP1.C to a local directory on your client machine.
2. Use the supplied makefile `dessamp` to compile and link the sample files.
3. Run the utility `DESRESTB` to create a result table in the database that you intend to use with the sample code:

   ```
   DESRESTB database-name
   ```

   This table is used to store information such as the search results; it has the following structure:

Column	Data type
HANDLE	DB2TX.DB2TEXTH or DB2TX.DB2TEXTFH
RANK	DOUBLE
MATCHES	INTEGER

Sample API program

Chapter 16. Error event reason codes

This chapter lists the error events that can occur when Text Extender indexes documents. This can occur, for example, when:

- Documents cannot be found
- Documents cannot be indexed
- Documents are indexed, but a problem occurs
- A language dictionary cannot be found.

Tip

If a reason code is not documented:

1. Check that there is enough disk space.
2. Collect all the error information that is available:
   - desdiag.log file
   - Event message
3. Call your IBM service representative.

1 Out of storage. The server is of memory: reduce the workload.

64 Conflicting tasks running. A reorganization process and an update process cannot be executed on the same index.

116
Datastream syntax error

280
The document has not been indexed. One of the index files could not be opened.

281
The document has not been indexed. One of the index files could not be read.

500
The document has not been indexed. The Library Services could not be loaded. Maybe the DLL is not available or the resource path is invalid.

501
The document has not been indexed. Lib_Init in Library Services failed On Flat File systems: DIT file not found or not on a valid directory, or DIT contents not correct.

502
The document has not been indexed. An error has occurred while reading the document content in library service LIB_read_doc_content.

503
The document has not been indexed. An error occurred in library service LIB_access_doc.

504
The document has not been indexed. The library service LIB_doc_index_status returned an error.

505
Close document failed. The library service LIB_close_doc returned an error.

506
End Library Services failed. The library service LIB_end returned an error.

507
Access document failed. The library service LIB_access_doc returned an error. Processing is stopped. Reset the index status and restart the update process.

551, 553, 555, 556, 567, 569, 570, 571, 573, 574, 575, 576, 606, 608, 610, 619
The document has not been indexed. One of the index files could not be opened.

624
Out of storage (alloc failed). The server ran out of memory: reduce workload.

659
One of the temporary files created during indexing could not be opened.

660
One of the temporary files created during indexing could not be written.

662
One of the temporary files created during indexing could not be opened.

663
One of the temporary files created during indexing could not be written.

665
One of the temporary files created during indexing could not be opened.

667
One of the temporary files created during indexing could not be written.

805
Linguistic service Read Document failed. Check the file `desdiag.log` to get additional information, such as a linguistice service return code.

831
The document has not been indexed. No text has been found. The document length is 0 bytes.

860
File open error (dictionary or thesaurus not found)

1000
An error occurred during file open. Please check access rights.

1001
An error occurred during file append. Please check access rights.

1002
An error occurred during file read. Maybe the file is corrupted.

1003
An error occurred during file write. Please check disk space and access rights.

1007
An error occurred during file create. Please check access rights.

1010
The specified index name is already in use. Use another index name.

1011
The specified path is already in use. Use another location.

1012
The same path is used for data and working directory. Use another location.

1013
The specified index name is invalid. Index names must be uppercase or digits and not longer than 8 characters.

1017
The index name is unknown. Please check correct spelling.

1020
General file error. Please check access rights.

1072
The document has not been indexed. The specified codepage is invalid.

1073
The document has not been indexed. The specified codepage is invalid for this index type.

1085
The document has not been indexed. An error occurred when reading the index queue.

1086
The document has not been indexed. The index queue is empty.

1129
No document has been indexed. Starting the background processing failed.

2000
The document has not been indexed. The document type is not supported. Library service Lib_access_doc returned an invalid document type.

2001
The document has not been indexed. An incorrect sequence of fields has been detected in the document's data stream.

2002
The document has not been indexed. An incorrectly structured field has been detected in the document's data stream.

2003
The document has not been indexed. Only one text section is allowed for a document in Text Extender text format.

2004
The document has not been indexed. A hypermedia reference that is longer than 512 bytes has been detected in a document in Text Extender text format.

2005
The document has not been indexed. A language specified in the document's data stream is not supported.

2006
The document has not been indexed. A CCSID specified in the document's data stream is not supported.

2007
The expected document format given by the library or by the default rule is not correct. The document header is incorrect for the format. Check if the default rule is a document with a special document header, and change if the rule is not correct.

2008
The document was not indexed because it could not be accessed.

2009
The document was not indexed because it was in use and could not be accessed.

2010
The document has not been indexed. The specified CCSID is not correct.

2011
The document has not been indexed because it is not a valid IBM DCA RFT or FFT document. End-of-page must be the last control in the body text of the document.

2012
The document has not been indexed because it is not a valid IBM DCA RFT or FFT document. A structured field contains an incorrect length specification.

2013
The document has not been indexed because it is not a valid IBM DCA RFT or FFT document. An incorrect control has been detected in the document.

2014
The document has not been indexed because it is not a valid IBM DCA RFT or FFT document. An incorrect multi-byte control or structured field has been detected in the document.

2015
The document has not been indexed because it is not a valid IBM DCA RFT or FFT document. Duplicate document parameters have been found.

2016
The document has not been indexed because it is not a valid IBM DCA RFT or FFT document. An empty text unit has been found.

2018
Either the document is in a format that is not supported, or there is an "exclude" entry in the DIT for the document's extension. Check that the document has a extension that allows it to be indexed.

2020
The document has not been indexed. It is neither a WordPerfect document nor a WordPerfect file.

2021
The document has not been indexed. It is a WordPerfect file but not a WordPerfect document.

2022
The document has not been indexed. This version of WordPerfect is not supported.

2023
The document has not been indexed. It is an encrypted WordPerfect file. Store the document without encryption.

2026
An END_TXT occurred in a footnote or an endnote. Check the WordPerfect file, it may be damaged.

2030
The document has not been indexed. Either it is not a Microsoft Word file or it is a version of Word that is not supported.

2031
The document has not been indexed. Unexpected end-of-file has been detected in a Microsoft Word document.

2032
The document has not been indexed. An incorrect control has been detected in a Microsoft Word document.

2033
The document has not been indexed. It was saved in *complex* format with the *fastsave* option. Save it with the *fastsave* option off.

2034
The document has not been indexed. A required field-end mark is missing in a Microsoft Word document.

2035
The document is encrypted. Store the document in Microsoft Word without encryption.

2036
This is a Word for Macintosh document; it cannot be processed. Store the document in Word for Windows format.

2037
This Word document contains embedded OLE objects.

2040
The document has not been indexed because it is not a valid ECTF file.

2041
The document has not been indexed. It contains an .SO LEN control that is not followed by a number.

2042
The document has not been indexed. It contains an .SO LEN control that is followed by an incorrect number. The number must be between 1 and 79.

2043
The document has not been indexed. Only one .SO DOC control is allowed. Save each ECTF document in a separate file.

2044
The document has not been indexed. An .SO HDE control must be followed by begin and end tags.

2045
The document has not been indexed. The hypermedia reference begin or end tag is too long.

2046
The document has not been indexed. The document contains text before the .SO DOC control.

2047
The document has not been indexed. The document contains text before an .SO PID control.

2048
The document has not been indexed. An end tag is missing after a begin tag.

2049
The document has not been indexed. A hypermedia reference has been detected that is longer than 80 bytes.

2050
The document has not been indexed. Incorrect tags have been detected following an .SO HDE control.

2051
The document has not been indexed. End-of-line has been detected after an .SO control.

2052
The document has not been indexed. Unexpected end-of-text has been detected.

2060
The document has not been indexed. Either it is not an AmiPro document or it is a version of AmiPro that is not supported.

2061
The document has not been indexed. The length of a control in an AmiPro document is too long.

2062
The document has not been indexed. This version of AmiPro is not supported. Only AmiPro Architecture Version 4 is supported.

2063
AmiPro Style Sheets have not been indexed.

2064
The document has not been indexed. An incorrect character set has been detected. Only Lotus Character Set 82 (Windows ANSI) is supported.

2065
The document has not been indexed. Unexpected end-of-file has been detected in an AmiPro document.

2072
The document cannot be scanned because it is encrypted.

2073
The document format is inconsistent.

2074
The document has the "bad file" flag bit set.

2080
The document has not been indexed. Either it is not an RTF document or it is a version of RTF that is not supported.

2081
The document has not been indexed. An RTF control word has been detected that is too long.

2083
The document has not been indexed. Macintosh code page is not supported.

2084
The document has not been indexed. It is an RTF document, but this RTF version is not supported. Only RTF Version 1 is supported.

2100
The document is damaged or unreadable for some other reason. A new common parser could correct the problem.

2101
The document cannot be indexed because it is empty or it contains no text. Check whether the document contains only graphics.

2102
The document cannot be indexed because it is either password-protected or encrypted.

2105
The document type is known, but the filter is not available.

2106
The document cannot be indexed because it is empty.

2107
The document cannot be indexed because it cannot be opened. Check document access.

2112
The document cannot be indexed because it is an executable file.

2113
The document cannot be indexed because it is compressed.

2114
The document cannot be indexed because it is a graphic. If the graphic document format returns an acceptable piece of text, then request to include this document format in the indexing process.

2120
The output file of the user exit does not exist or is not accessible. A new common parser version could correct the problem.

2121
The output file cannot be opened for read or it is empty. A new common parser version could correct the problem.

2122
Attempting to use a user-exit output file, but no file name has been given or set in the object.

2130
The user exit program could not be run. Check if the executable can be found in the path set by the PATH environment variable. Create a trace and dump to get additional information about the environment (errno) return codes.

2131
The user exit program failed with a bad return code. Create a trace and dump to get additional information about the environment (errno) return codes.

Part 3. Appendixes

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Programming interface information

This publication is intended to help you administer Text Extender and develop programs for use with Text Extender. This publication documents General-use Programming Interface and Associated Guidance Information provided by Text Extender.

General-use programming interfaces allow you to write programs that obtain the services of Text Extender. You may copy the Text Extender run-time feature needed for the application you develop onto client or server machines. To install the run-time feature , see the installation instructions provided in the README.TXT file for your operating system on the DB2 extenders CD-ROM. To install the run-time feature onto a server machine, see the installation instructions provided in the extender sections of the Program Directory for DB2 for OS/390 V6.

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Glossary

This glossary defines many of the terms and abbreviations used in this manual. If you do not find the term you are looking for, refer to the index or to the *Dictionary of Computing*, New York: McGraw-Hill, 1994.

A

access function. A user-provided function that converts the data type of text stored in a column to a type that can be processed by Text Extender.

administration. The task of preparing text documents for searching, maintaining indexes, and getting status information.

API. Application programming interface.

application programming interface (API). A general-purpose interface between application programs and the Text Extender information retrieval services.

B

Boolean search. A search in which one or more search terms are combined using Boolean operators.

bound search. A search in Korean documents that respects word boundaries.

browse. To view text displayed on a computer monitor.

browser. A Text Extender function that enables you to display text on a computer monitor.

C

catalog view. A view of a system table created by Text Extender for administration purposes. A catalog view contains information about the tables and columns that have been enabled for use by Text Extender.

CCSID. Coded Character Set Identifier.

code page. An assignment of graphic characters and control function meanings to all code points. For example, assignment of characters and meanings to 256 code points for an 8-bit code.

command line processor. A program called DB2TX that:

Allows you to enter Text Extender commands

Processes the commands

Displays the result.

common-index table. A DB2 table whose text columns share a common text index. See also *multi-index table*.

count. A keyword used to specify the number of levels (the depth) of terms in the thesaurus that are to be used to expand the search term for the given relation.

D

data stream. Information returned by an API function, comprising text (at least one paragraph) containing the term searched for, and information for highlighting the found term in that text.

DB2 Extender. One of a group of programs that let you store and retrieve data types beyond the traditional numeric and character data, such as image, audio, and video data, and complex documents.

DBCS. Double-byte character support.

dictionary. A collection of language-related linguistic information that Text Extender uses

during text analysis, indexing, retrieval, and highlighting of documents in a particular language.

disable. To restore a subsystem, a text table, or a text column, to its condition before it was enabled for Text Extender by removing the items created during the enabling process.

distinct type. See *user-defined distinct type*.

document. See *text document*.

document handle. See *handle*.

document model. The definition of the structure of a document in terms of the sections that it contains. A document model makes Text Extender aware of the sections within documents when indexing. A document model lists the markup tags that identify the sections. For each tag you can specify a descriptive section name for use in queries against that section. You can specify one or more document models in a document model file.

dual index. A *text index* having the characteristics of a *precise index* and a *linguistic index*. See also *Ngram index*.

E

enable. To prepare a subsystem, a text table, or a text column, for use by Text Extender.

environment variable. A variable used to provide defaults for values for the Text Extender environment.

environment profile. A script provided with Text Extender containing settings for *environment variables*.

escape character. A character indicating that the subsequent character is not to be interpreted as a *masking character*.

expand. The action of adding to a search term additional terms derived from a thesaurus.

extended matching. A process involving the use of a *dictionary* to highlight terms that are not obvious matches of the search term.

extender. See *DB2 Extender*.

external file. A text document in the form of a file stored in the operating system's file system, rather than in the form of a cell in a table under the control of DB2.

F

file handle. See *handle*.

format. The type of a document, such as ASCII, or WordPerfect.

free-text search. A search in which the search term is expressed as free-form text – a phrase or a sentence describing in natural language the subject to be searched for.

function. See *access function*.

fuzzy search. A search that can find words whose spelling is similar to that of the search term.

H

handle. A binary value that identifies a text document. It includes:

- A document ID
- The name and location of the associated index
- The document's *text information*
- If the document is located in an external file not under the control of DB2, the path and name of the file.

A handle is created for each text document in a text column when that column is *enabled* for use by Text Extender.

highlighting information. See *data stream*.

hybrid search. A combined *Boolean search* and *free-text search*.

I

index. To extract significant terms from text, and store them in a *text index*.

index characteristics. Properties of a *text index* determining:

- The directory where the index is stored
- The index type
- The frequency with which the index is updated
- When the first index update is to occur.

index type. A characteristic of a *text index* determining whether it contains exact or linguistic forms of document terms, or both. See *precise index*, *linguistic index*, *dual index*, and *Ngram index*.

initialized handle. A *handle*, prepared in advance, containing only the text format, or the text language, or both.

instance. A logical Text Extender environment. You can have several instances of Text Extender on the same workstation, but only one instance for each DB2 instance. You can use these instances to:

- Separate the development environment from the production environment
- Restrict sensitive information to a particular group of people.

instance variable. A variable used to provide a default value for the name of the *instance* owner, or the name of the instance owner's home directory.

L

language. The name of a *dictionary* to be used when *indexing*, searching and *browsing*.

linguistic index. A *text index* containing terms that have been reduced to their base form by linguistic processing. "Mice", for example, would be indexed as "mouse". See also *precise index*, *Ngram index*, and *dual index*.

log table. A table created by Text Extender containing information about which text documents are to be indexed. *Triggers* are used to store this information in a log table whenever a document in an enabled text column is added, changed, or deleted.

M

masking character. A character used to represent optional characters at the front, middle, and end of a search term. Masking characters are normally used for finding variations of a term in a precise index.

match. The occurrence of a search term in a text document.

multi-index table. A DB2 table whose text columns have individual *text indexes*. See also *common-index table*.

N

Ngram index. A *text index* that supports DBCS documents and fuzzy search of SBCS documents. See also *linguistic index precise index* and *dual index*.

nodegroup. A named subset of one or more database partition servers. *node* assigned to a physically separate machine. See also *logical node*.

O

occurrence. Synonym for *match*.

P

periodic indexing. Indexing at predetermined time intervals, expressed in terms of the day, hour, and minute, and the minimum number of documents names that must be listed in the *log table* for indexing, before indexing can take place.

physical node. A *node* assigned to a physically separate machine. See also *logical node*.

precise index. A *text index* containing terms exactly as they occur in the text document from

which they were extracted. See also *linguistic index Ngram index* and *dual index*.

profile. See *environment profile*.

R

rank. An absolute value of type DOUBLE between 0 and 1 that indicates how well a document meets the search criteria relative to the other found documents. The value indicates the number of matches found in the document in relation to the document's size.

refine. To add the search criteria from a previous search to other search criteria to reduce the number of *matches*.

retrieve. To find a text document using a search argument in one of Text Extender's search functions.

S

SBCS. Single-byte character support.

search argument. The conditions specified when making a search, consisting of one or several search terms, and search parameters.

shell profile. See *environment profile*.

stop word. A common word, such as "before", in a *text document* that is to be excluded from the *text index*, and ignored if included in a *search argument*.

T

text column. A column containing *text documents*.

text configuration. Default settings for index, text, and processing values.

text document. Text of type CHAR, GRAPHIC, VARGRAPHIC, LONG VARGRAPHIC, DBCLOB, VARCHAR, LONG VARCHAR, or CLOB, stored in a DB2 table.

text index. A collection of significant terms extracted from text documents. Each term is associated with the document from which it was extracted. A significant improvement in search time is achieved by searching in the index rather than in the documents themselves. See also *precise index*, *linguistic index*, and *dual index*.

text information. Properties of a *text document* describing:

The *CCSID*

The *format*

The *language*.

text table. A DB2 table containing *text columns*.

tracing. The action of storing information in a file that can later be used in finding the cause of an error.

trigger. A mechanism that automatically adds information about documents that need to be indexed to a *log table* whenever a document is added, changed, or deleted from a text column.

U

UDF. User-defined function.

UDT. User-defined distinct type.

update frequency. The frequency with which a text index is updated, expressed in terms of the day, hour, and minute, and the minimum number of document names that must be listed in the *log table* for indexing, before indexing can take place.

user-defined distinct type (UDT). A data type created by a user of DB2, in contrast to a data type provided by DB2 such as LONG VARCHAR.

user-defined function (UDF). An SQL function created by a user of DB2, in contrast to an SQL function provided by DB2. Text Extender provides search functions, such as CONTAINS, in the form of UDFs.

W

wildcard character. See *masking character*.

WLM. Work Load Manager

Index

Special Characters

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Text Extender: Administration and Programming
Version 6

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